77th Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery & 4th World Trauma Congress

• September 26-29•

2018

Manchester Grand Hyatt
• San Diego, CA •

World Coalition for Trauma Care

HISTORICAL BACKGROUND

AAST

The American Association for the Surgery of Trauma started with conversations at the meetings of the Western Surgical Association and Southern Surgical Association in December, 1937. The 14 founders, who were present at one or both of these meetings, subsequently invited another 68 surgeons to a Founding Members meeting in San Francisco on June 14, 1938. The first meeting of the AAST was held in Hot Springs, Virginia, in May, 1939, and Dr. Kellogg Speed's first Presidential Address was published in *The American Journal of Surgery* 47:261-264, 1940. Today, the Association holds an annual scientific meeting, owns and publishes *The Journal of Trauma and Acute Care Surgery*, which was initiated in 1961, and has approximately 1,300 members from 30 countries.

WCTC

The World Coalition for Trauma Care was created during the 1st World Trauma Congress in Rio de Janeiro, Brazil in August 2012. The WCTC is a coalition of professional trauma organizations from across the world. The goals of the WCTC are to increase awareness of the importance of trauma as a disease worldwide, spread trauma education at all levels worldwide, develop trauma systems worldwide, and the continuation of the World Trauma Congress. These organizations (and their members) have the opportunity to exert international influence, help less developed nations to improve care by means of better education and knowledge, critical thinking towards systems development, data collection (trauma registries and injury surveillance), and implementation of quality improvement processes.

American Association for the Surgery of Trauma (AAST)

Annual Meeting of AAST and Clinical Congress of Acute Care Surgery
Learning Objectives and Outcomes

This activity is designed for surgeons. Upon completion of this course, participants will be able to:

- Exchange knowledge pertaining to current research practices and training in the surgery of trauma.
- Design research studies to investigate new methods of preventing, correcting, and treating acute care surgery (trauma, surgical critical care, and emergency surgery) injuries.

CONTINUING MEDICAL EDUCATION CREDIT INFORMATION

Accreditation

This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the American College of Surgeons and American Association for the Surgery of Trauma. The American College of Surgeons is accredited by the ACCME to provide continuing medical education for physicians.

AMA PRA Category 1 Credits™ - Annual Meeting

The American College of Surgeons designates this live activity for a maximum of **40.00** *AMA PRA Category 1 Credits™.* Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Of the *AMA PRA Category 1 Credits*™ listed above, a maximum of **12.50** credits meet the requirements for Self-Assessment.

Of the *AMA PRA Category 1 Credits*™ listed above, a maximum of **37.75** credits may qualify as **Trauma**.*

Of the *AMA PRA Category 1 Credits*™ listed above, a maximum of **5.25** credits may qualify as **Surgical Critical Care**.*

Of the *AMA PRA Category 1 Credits*™ listed above, a maximum of **2.00** credits may qualify as **Pediatric Trauma**.*

** The content of this activity may meet certain mandates of regulatory bodies. ACS has not and does not verify the content for such mandates with any regulatory body. Individual physicians are responsible for verifying the content satisfies such requirements.*

AMERICAN COLLEGE OF SURGEONS
Inspiring Quality:
Highest Standards, Better Outcomes
100+years

AMERICAN COLLEGE OF SURGEONS
DIVISION OF EDUCATION

Society of Trauma Nurses

This year, the Society of Trauma Nurses is offering CNE for its nursing track at the annual meeting. To claim CNE, participants will complete session evaluations electronically using the instructions provided during the sessions. On-site faculty of the courses will provide handouts with the link to claim CNE.

The Society of Trauma Nurses is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center's Commission on Accreditation. This activity has been awarded a maximum of 11 contact hours.

Educational Grants

The American Association for the Surgery of Trauma wishes to recognize and thank the following companies for their ongoing support through educational grants:

- Karl Storz
- Cook Medical, LLC

Disclosure Information

77th Annual Meeting of the AAST and Clinical Congress of Acute Care Surgery

September 26-29, 2018

San Diego, CA

In accordance with the ACCME Accreditation Criteria, the American College of Surgeons, as the accredited provider of this activity, must ensure that anyone in a position to control the content of the educational activity has disclosed all relevant financial relationships with any commercial interest. Therefore, it is mandatory that both the program planning committee and speakers complete disclosure forms. Members of the program committee were required to disclose **all** financial relationships and speakers were required to disclose any financial relationship **as it pertains to the content of the presentations**. The ACCME defines a 'commercial interest' as "any entity producing, marketing, re-selling, or distributing health care goods or services consumed by, or used on, patients". It does not consider providers of clinical service directly to patients to be commercial interests. The ACCME considers "relevant" financial relationships as financial transactions (in any amount) that may create a conflict of interest and occur within the 12 months preceding the time that the individual is being asked to assume a role controlling content of the educational activity.

ACS is also required, through our joint sponsorship partners, to manage any reported conflict and eliminate the potential for bias during the activity. All program committee members and speakers were contacted and the conflicts listed below have been managed to our satisfaction. However, if you perceive a bias during a session, please report the circumstances on the session evaluation form.

Please note we have advised the speakers that it is their responsibility to disclose at the start of their presentation if they will be describing the use of a device, product, or drug that is not FDA approved or the off-label use of an approved device, product, or drug or unapproved usage.

The requirement for disclosure is not intended to imply any impropriety of such relationships, but simply to identify such relationships through full disclosure and to allow the audience to form its own judgments regarding the presentation.

Presenter	Nothing to Disclose	Disclosure		
		Company	Role	Received
Michael Aboutanos	No			
Sasha Adams	No			
Tessa Adzemovic	No			
John Agapian	No			
Suresh Agarwal	No			
Rebecka Ahl	No			
Nasim Ahmed	No			
Taku Akashi	No			
Abdul Alarhayem	No			
Roxie Albrecht	No			
Daniel Alfson	No			
Fahd Ali	No			
Muhammad Ali Chaudhary	No			
Georgina Alizo	No			

Jamie Anderson	No			
Sam Arbabi	No			
Dennis Ashley	No			
Emily Ashworth	No			
Steven Baddour	No			
Jeff Bailey	No			
Eirc Ballon-Landa	No			
Zsolt Balogh	No			
Brittany Bankhead-Kendall	No			
James Bardes	No			
Galinos Barmparas	No			
Stephen Barnes	No			
Erik Barquist	No			
Ronit Bassa	No			
Robert Becher	No			
Ramy Behman	No			
Brandon Behrens	Yes	Grifols	Presented findings of study at symposium	Presenter
Omar Bekdache	No			
Theresa Bell	No			
Elizabeth Benjamin	No			
Matthew Benns	No			
Andrew Bernard	No			
Allison Berndtson	No			
Maunil Bhatt	No			
Walter Biffl	No			
David Blake	No			
Matthew Bloom	No			
Grant Bochicchio	No			
Ken Boffard	No			
Alicia Bonanno	No			
Stephanie Bonne	No			

Raquel Bono	No			
Bertil Bouillon	No			
Jason Bowie	No			
Mark Bowyer	No			
Kelly Boyle	No			
Scott Brakenridge	No			
Karen Brasel	No			
Megan Brenner	Yes	Prytime Medical, Inc.	Stock Options	Clinical Advisory Board Member
Alexandra Briggs	No			
William Bromberg	No			
Adam Brooks	No			
Carlos Brown	No			
Zachary Brown	No			
Joshua Brown	No			
Susan Brundage	Yes	AIG Insurance Limited Europe/UK	Honorarium – November 2017	Consultant
Brandon Bruns	No			
Eileen Bulger	No			
Jessica Burgess	No			
Karen Burtt	No			
Karyn Butler	No			
William Butler	No			
Rachael Callcut	No			
Andre Campbell	No			
Brendan Campbell	No			
Tercio Campos	No			
Jeremy Cannon	No			
Bryan Carr	No			
Shannon Carroll	No			
Damien Carter	No			
Thomas Carver	No			

David Carver	No			
Theresa Chan	No			
Felix Chang	No			
Stephanie Chao	No			
Jose Charry	No			
Li-Chien Chien	No			
William Chiu	No			
S. Ariane Christie	No			
Christine Chung	No			
Mark Cipolle	No			
Ian Civil	No			
Keith Clancy	No			
Christine Cocanour	Yes	Octapharma, ATO Bio	Expenses and payment for time	DSMB Committee Member, Site PI
Federico Coccolini	No			
Panna Codner	No			
Mitchell Cohen	No			
Nina Cohen	No			
Raul Coimbra	No			
Jamie Coleman	No			
Julia Coleman	No			
John Como	No			
Jorge Con	No			
Heitor Consani	No			
R. Consunji	No			
John Cook-Jong Lee	No			
Zara Cooper	No			
John Cordero	No			

Todd Costantini	No			
Clay Cothren Burlew	No			
Bryan Cotton	Yes	Haemonetics CORP (Braintree, MA)	Consultant Fees	Scientific Advisory Council Board Member
Jessica Cox	No			
Marie Crandall	No			
Chris Cremona	No			
Michael Cripps	No			
Matrin Croce	No			
Bruce Crookes	No			
Jose Cruvinel	No			
Bruno Jose Da Costa Medeiros	No			
Jose Mauro da Silva Rodrigues	No			
Scott D'Amours	No			
Imad Dandan	No			
Omar Danner	No			
Elizabeth Dauer	No			
Kimberly Davis	No			
James Davis	No			
Leonie De Munter	No			
Ana Del Valle	No			
Marc deMoya	No			
Christopher Dente	No			
Michael DeWane	No			
Salmone Di Saverio	No			
Jose Diaz	No			
Rochelle Dicker	No			
Lawrence Diebel	No			
Jody DiGiacomo	No			
Charles DiMaggio	No			

Woo Do	No			
Alcir Dorigatti	No			
Jay Doucet	No			
Jeremy Dressler	No			
Michael Dubick	No			
Joseph DuBose	No			
Juan Duchesne	No			
Lauren Dudas	No			
Thomas Duncan	No			
Cecily DuPree	No			
Oscar Dussan	No			
Alexander Eastman	No			
Brian Eastridge	No			
Catherine Eaton Sharoky	No			
David Efron	No			
Teunis van Egmond	No			
Adel Elkbuli	No			
Eric Elster	No			
Akira Endo	No			
Thomas Esposito	No			
Alicia Eubanks	No			
Susan Evans	No			
Tala F Kana'an	No			
Timothy Fabian	No			
Samir Fakhry	No			
Richard Falcone	No			
Michael Farrell	No			
Vitor Favali Kruger	No			
David Feliciano	No			
Maria Fernanda Oliva Detanico	No			
Forrest Fernandez	No			

Paula Ferrada	No			
John Fildes	No			
Caitlin Fitzgerald	No			
Erika Flashburg	No			
Matthew Fleming	No			
Neal Foley	No			
Joseph Forrester	No			
Nicole Fox	No			
Gustava Fraga	No			
Jessica Friedman	No			
Chih-Yuan Fu	No			
Xizo-bing Fu	No			
Takashi Fujita	No			
Tomohiro Funabiki	No			
Elisa Furay	No			
Christina Gaarder	No			
Joseph Galante	No			
Stephen Gale	No			
Alberto Garcia	No			
Diogo Garcia	No			
Ben Gardiner	No			
Tabitha Garwe	No			
Mitchell George	No			
Mark Gestring	No			
Laura Godat	No			
Amy Goldberg	No			
Johanna Gomez-Builes	No			
Adolfo Gonzalez	No			
Roberto Gonzalez	No			
Dan Grabo	No			
Areg Grigorian	No			
Ronald Gross	No			
Jessica Gross	No			

Jacopo Guerrini	No			
Oscar Guillamondegui	No			
Oliver Gunter	No			
Amit Gupta	No			
Rajan Gupta	No			
Jennifer Gurney	No			
Jennifer Gurney	No			
Barbara Haas	No			
Adil Haider	No			
Ansab Haider	No			
Krista Haines	No			
Sascha Halvahizadeh	No			
Mohammad Hamidi	No			
Ahram Han	No			
Laura Harmon	No			
John Harvin	No			
Zain Hashmi	No			
Carlos Hauser	No			
Elliott Haut	No			
Felco Heitbrink	No			
Sharon Henry	No			
Matthew Hernandez	No			
Juan Herrera-Escobar	No			
Lillian Hesselink	No			
Falco Hietbrink	No			
William Hoff	No			
John Holcomb	Yes	Decisio Health, Prytime Medical, Terumo BCT, UT System	Shares, salary and options, reinbursement, royalty	CMO, founder and BoD, consultant, co-inventor of JETT
Daniel Holena	No			
Kenichiro Hondo	No			
Heather Hoops	Yes	Resusitech, Inc.	Inventor On	None

			Patents For Selective Aortic Arch Perfusion. Co-Founder Of Resusitech, Inc., A Medical Device Company Developing Resuscitation Devices, Including Selective Aortic Arch Perfusion	
J. Jason Hoth	No			
Erin Howell	No			
David Hoyt	No			
Li Hsee	No			
Chi-Hsun Hsieh	No			
Ruo-Yi Huang	No			
Jennifer Hubbard	No			
Eric Hungness	Yes	Baxter	Honorarium	Conjultin 6
Franchesca Hwang	No			
Joseph Ibrahim	Yes	Prytime Medical	Speaking Consultant	Speaking Consultant
Chan Ik Park	No			
Kenji Inaba	No			
Angela Ingraham	No			
Kaori Ito	No			
Christina Jacovides	No			
Vinod Jain	No			
Molly Jarman	No			
David Jeffcoach	No			
Faisal Jehan	No			
Jan Jensen	No			
Kai Jensen	No			
Aaron Jensen	No			
Elan Jeremitsky	No			
Maria Jimenez	No			
Younggoun Jo	No			

Jay Johannigman	No			
D'Andrea Joseph	No			
Kimberly Joseph	No			
Bellal Joseph	No			
Christopher Josten	No			
Anamaria Joyce Robles	No			
Catherine Julliard	No			
Kyoungwong Jung	No			
Gregory Jurkovich	No			
Fabiana Kain De Moura	No			
Kyle Kalkwarf	No			
Wuseong Kang	No			
Lillian Kao	Yes	UpToDate	Royalties	Section Editor
Yusuke Katayama	No			
Morihiro Katsura	No			
Taku Kazamaki	No			
Marius Keel	No			
Sorena Keihani	No			
Bijan Keirabadi	No			
Katherine Kelley	No			
Abid Khan	No			
Takeyuki Kiguchi	No			
Fernando Kim	No			
Dennis Kim	No			
Jungchui Kim	No			
Jennie Kim	No			
Maru Kim	No			
Kihoon Kim	No			
Patrick Kim	No			
Jae Hun Kim	No			
Akio Kimura	No			

Takahiro Kinoshita	No			
Heidi Kippers Mullen	No			
Andrew Kirkpatrick	Yes	Acelity, Innovative Trauma Care, And Cook Medical Corps	Consultant	I Have Consulted For The Acelity, Innovative Trauma Care, And Cook Medical Corporations
Orlando Kirton	No			
Ariel Knight	No			
Lisa Knowlton	No			
Margaret Knudson	No			
Mitsuaki Kojima	No			
Radko Komadina	No			
Victor Kong	No			
Manasnun Kongwibulwut	No			
Rosemary Kozar	No			
Laura Kreiner	No			
Deborah Kuhls	No			
Vignesh Kumar	No			
Eric Kuncir	No			
Ling-Wei Kuo	No			
Hayato Kurihara	No			
Shigeki Kushimoto	Yes	CSL Behring	Honorarium	Scientific Advisory Committee
Dorian Lamis	No			
Mary Lancake	No			
Margaret Lauerman	No			
Adam Laytin	No			
Hak-Jae Lee	No			
Luke Leenen	No			
Ari Leppaniemi	No			
Robert Letton	No			

Richard Lewis	No			
Zhanfei Li	No			
Lei Li	No			
Chien-Huang Liao	No			
Sean Liebscher	No			
Robert Lim	Yes	UpToDate, Inc.	Honorarium	Consultant
Tzu-hsin Lin	No			
Brittany LisJak	No			
David Livingston	No			
Tyler Loftus	No			
Larry Lottenberg	Yes	Haemonetics, synthesis, KLS Martin	N/A	Speaker
Stephanie Lueckel	No			
Jeffrey Luke Ban Eps	No			
Douglas Lundy	Yes	Depuy Synthes	Payment	Speaker
Neal Lynch	No			
Kasey Lynne Hamrick	No			
David Machado-Aranda	No			
Robert Mackersie	No			
Jana MacLeod	No			
Richard Maduka	No			
Ronald Maier	No			
Rebecca Maine	No			
Ajai Malhotra	No			
Sean Maloney	No			
Ramiro Manzano Nunez	No			
Daniel Margulies	No			
Matthew M Martin	No			
Niels Martin	No			
Grace Martin	No			
Ingo Marzi	No			
Peter Masiakos	No			
Shokei Matsumoto	No			

Yosuke Matsumura	No			
Kazuhide Matsushima	No			
Hiroshi Matsuura	No			
Adrian Maung	No			
Todd Maxson	No			
Addison May	Yes	Atox Bio, LTD., Atod Bio. LTD, Fresenius Kabi	Research funding to my institution, consulting fees, research funding to my institution	Local PI for industry sponsored clinical trial, Consultant, adjudication panel for trial, principle investigator, sponsored research
Michael Mazzei	No			
Maryann Mbaka	No			
Allison McNickle	No			
Christopher McNicoll	No			
Michelle McNutt	No			
Ashley Meagher	No			
Amber Mehmood	No			
Ambar Mehta	No			
Carlos Menegozzo	No			
Carlos Mesquita	No			
Christopher Michetti	No			
Preston Miller	No			
Keith Miller	No			
Joseph Minei	No			
Biplab Mishra	No			
Samir Misra	No			
Alicia Mohr	No			
Charles Moon	Yes	Stryker Trauma, DJO, Bone Support	Consulting Fees, Research Support, Research Support	Consultant, PI, PI
Jae Moo Lee	No			

Ernest Moore	Yes	1. Haemonetics 2. Instrumentation Laboratories 3. Prytime 4. Thrombo Therapeutics	1. Research Support 2. Research Support 3. Research Support 4. Stock	1. PI 2. PI 3. Co-PI 4. Co-Founder
Lynne Moore	No			
Kerry Moore	No			
Shusuke Mori	No			
Koji Morishita	No			
David Morris	No			
Anne Mosenthal	No			
Rachel Moses	No			
Nathan Mowery	No			
Seongpyo Mun	No			
Yahinori Murao	No			
Patrick Murphy	No			
Sara Myers	No			
Paal Naess	No			
Tsuyoshi Nagao	No			
Celina Nahanni	No			
Nicholas Namias	No			
Lena Napolitano	No			
Mayur Narayan	No			
Avery Nathens	Yes	Employee of American College of Surgeons	Salary	Medical Director
Deppika Nehra	No			
Mariana Neves Fernandes	No			
Paige Newell	No			
Susannah Nicholson	No			
Raminder Nirula	No			
Takeshi Nishimura	No			
Charles Noon	No			
David Nortica	No			

Geoffrey Nunns	No			
Takayuki Ogura	No			
Bryant Oliphant	No			
Erik Olson	No			
Alexander Olson	No			
Alessandro Orlando	No			
Per Ortenwall	No			
Yasuhiro Otomo	No			
Yuta Oyama	No			
Orkun Ozkurtul	No			
Maranda Pahlkotter	No			
Yu Pan	No			
Pauline Park	No			
Michael Parr	No			
Jose Parreira	No			
Neil Parry	No			
Jose Pascual	No			
Pascual Pascual	No			
Mayur Patel	No			
Shibani Pati	No			
Andrew Peitzman	No			
Xu-Xiang Peng	No			
Rueben Peralta	No			
Bruno Pereira	No			
Gennaro Perrone	No			
Jennifer Philip	No			
Peter Philip Olivieri	No			
Vanessa Phillis Ho	No			
Fredric Pieracci	Yes	DePuy Synthes	Research Funding	Research Funding, Paid Consultant
Joost Plate	No			
Travis Polk	No			

Morgan Pomeranz	No			
Carina Pothmann	No			
Dustin Price	No			
TA Pritts	No			
Paul Puchwein	No			
Ashok Puranik	No			
Leonard Rael	No			
Stephen Ranney	No			
Joseph Rappold	No			
Rishi Rattan	No			
Deviney Rattigan	No			
Lawrence Reed	No			
Patrick Reilly	No			
Peter Rhee	No			
Marcelo Ribeiro	Yes	Acelity KCI	Honorarium	Speaker
Daniel Ricaurte	No			
Christopher Rice	No			
Robert Riggs	No			
Lisbi Rivas	No			
Rachel Rivero	No			
Sandro Rizoli	No			
Bryce Robinson	No			
Bobby Robinson	No			
Jacob Roden-Foreman	No			
Carlos Rodriguez	No			
Frederick Rogers	No			
Linda Roney	No			
Graeme Rosenberg	No			
Michael Rotondo	No			
Susan Rowell	No			
Noah Rozich	No			
Grace Rozycki	No			
Jerry Rubano	No			

Sten Saar	No			
Javid Sadjadi	No			
Joseph Sakran	No			
Ali Salim	No			
Burapat Sangthong	No			
Riley Santiago	No			
Fernando Santos	Yes	Cook Medical	Consulting fees, research support (donated supplies)	Consultant, investigator-initiated research grant
Heena Santry	No			
Babak Sarani	No			
Angela Sauaia	No			
Stephanie Savage	No			
Robert Sawyer	Yes	Merck	N/A	N/A
Thomas Scalea	No			
Morgan Schellenberg	No			
Henry Schiller	No			
Nathan Schmoekel	No			
Martin Schreiber	Yes	Haemonetics	Payments to University	Consultant
Thomas Schroeppel	No			
Susan Schultz	No			
Kevin Schuster	No			
Linda Schutzman	No			
William Schwab	No			
Alexander Schwartz	No			
John Scott	No			
Lara Senekjian	No			
Steven Shackford	No			
Shahid Shafi	No			
John Sharpe	No			
Atsushi Shiraishi	No			
Francisco EduardoSilva	No			

Carrie Sims	No			
Michael Sise	No			
Robert Sise	No			
David Skarupa	No			
Jason Smith	No			
Steven Smith	No			
Alison Smith	No			
Kira Smith	No			
Lindsay Smith	No			
Jeffrey Smith	No			
Alexander Smolyar	No			
Hahn Soe-Lin	No			
Andrew Sorah	No			
David Spain	No			
Jason Sperry	No			
Roy Spijkerman	No			
Nicole Stassen	No			
Kristan Staudenmayer	No			
Deborah Stein	No			
Ronald Stewart	No			
Doug Stoddard	No			
Lance Stuke	No			
Joshua Sumislawski	No			
Takaaki Suzuki	No			
Mamta Swaroop	Yes	Vivacitas Oncology, Infusion SIA	Shares	CEO/CMO, CMO
Todd Swenning	No			
Yuji Takahashi	No			
Peep Talving	No			
Luis Taveras	No			
Bryce Taylor	No			
Ezra Teitelbaum	Yes	Cook Medical, Boston Scientific,	Honorarium, Consulting Fee	Educational speaker, Consultant

Dana Telem	No			
Robert Tessler	No			
John Tierney	No			
Christopher Tiganelli	No			
Samuel Tisherman	No			
Sandeep Tiwari	No			
Gail Tominaga	No			
Eric Toschlog	No			
Joshua Tseng	No			
Taichiro Tsunoyama	No			
Lily Tung	No			
Hiroshi Uasumatsu	No			
Kenichiro Uchida	No			
Hayaki Uchino	No			
Pasca lUdekwu	No			
Rindi Uhlich	No			
Tadashi Umehara	No			
Selman Uranus	No			
Nao Urushibata	No			
Ryosuke Usui	No			
Michael Vella	No			
Catherine Velopulos	No			
Gary Vercruysse	No			
Wouter Vints	No			
Eva Visser	No			
Rebecca Vogel	No			
Phoenix Vuong	No			
Ming-Li Wang	No			
Kai Wang	No			
Shang-Yu Wang	No			
Elizabeth Warnack	No			
Ross Weale	No			

Tay Wee Ming	No			
Shuyan Wei	No			
Jordan Weinberg	No			
Lyndsey Wessels	No			
Karlijn Wessem	No			
Sonlee West	No			
Michaela West	No			
Niluka Wickramaratne	No			
Brittney Williams	No			
Elliott Williams	No			
Aaron Williams	No			
Robert Willis	No			
Robert Winchell	Yes	Stryker	Consulting fee, expenses	Consultant
James Winearls	No			
Robert Winfield	No			
Philip Woilinsky	No			
Daniel Wu	No			
Sun Xingwei	No			
Paige Xu	No			
Masayuki Yagi	No			
Jay Yelon	No			
Ibrahim Yilmaz	No			
Carlos Yonez	No			
Jungchul Yun Park	No			
Mauro Zago	No			
Tanya Zakrison	No			
Ben Zarzaur	No			
Muhammad Zeeshan	No			
Savo Bou Zein Eddine	No			
Lianyang Zhang	No			
Guixi Zhang	No			
Caroline Zhu	No			

Nukhba Zia	No			
Martin Zielinski	No			
Cheryl Zogg	No			
David Zonies	No			

Presenter	Nothing To Disclose	Disclosure		
		Company	Role	Received
Planning Committee				
Christopher Michetti	No			
Patrick Reilly	No			
Lena Napolitano	No			
Robert Winchell	No			
Ernest Moore	Yes	Haemonetics, Instrumentation Laboratories, Prytime, Thrombo Therapeutics	Research Support, Research Support, Research Support, Stock	PI, PI, Co-PI, Co-Founder
Clay Cothren Burlew	No			
Martin Croce	No			
Michael Rotondo	No			
Eileen Bulger	No			
Jason Smith	No			
Ben Zarzaur	No			
Karen Brasel	No			
Rosemary Kozar	No			
Timothy Fabian	No			
David Spain	No			
Raul Coimbra	No			

AAST SCHEDULE

77th Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery

4th World Trauma Congress

General & Scientific Program Schedule

September 26-29, 2018 • San Diego, CA

*Meeting room locations are subject to change. Please check the Annual Meeting App for the most up to date room assignments.

Tuesday 9/25

7:00 am-12:00 pm	AAST Board of Managers Meeting *Location: Coronado DR, Fourth Level (Harbor Tower)*
11:00 am-7:00 pm	Satellite Registration *Location: Manchester Grand Hyatt Lobby (Near Market One)*
1:00-5:30 pm	PreSession: AAST ACS-MOC Session *Location: Coronado AB, Fourth Level (Harbor Tower)*
1:00-5:00 pm	PreSession: Military/International Session *Location: Coronado C, Fourth Level (Harbor Tower)*
1:00-5:00 pm	PreSession: Pediatric/Prevention Session *Location: Torrey Hill, Third Level (Seaport Tower)*
1:00-5:00 pm	PreSession: Acute Care Surgery Clinical Outcomes Research *Location: Golden Hill, Third Level (Seaport Tower)*
2:00-5:00 pm	PreSession: SAGES/ACS Session *Location: Hillcrest, Third Level (Seaport Tower)*
5:00-6:30 pm	PreSession: Networking Reception (must be registered for a PreSession to attend) *Location: Seaport Foyer, Second Level*

Wednesday 9/26

6:30 am-5:30 pm — Registration
Location: Seaport Foyer - Second Level

6:15-7:15 am — International Breakfast (registration required)
Speaker: Ingo Marzi, MD, *Local and Systemic Inflammation After Severe Trauma-Current Understanding and Clinical Implications*
Panelists: International Panel of Experts
Location: Coronado DE, Fourth Level (Harbor Tower)

6:15-7:15 am — Committee Meetings - Session I

Critical Care Committee	*Vista A, 32nd Level (Seaport Tower)*
Geriatric/ACS Trauma Committee	*Cityview B, 32nd Level (Seaport Tower)*
Journals Oversight Committee	*Vista B, 32nd Level (Seaport Tower)*
Patient Assessment Committee	*Skyline, 32nd Level (Seaport Tower)*
Research and Education Fund Committee	*Cityview A, 32nd Level (Seaport Tower)*

7:00-8:30 am — Continental Breakfast
Location: Seaport Foyer, Second Level

7:30-8:00 am — Opening Session
Location: Seaport D-H, Second Level (Seaport Tower)

Session I: Plenary Papers
Papers 1-8

Moderator: Michael Rotondo, MD

Recorder: Patrick Reilly, MD

Location: Seaport D-H, Second Level (Seaport Tower)

Paper 1 — ***8:00-8:20 am***
ACS-COT VERIFICATION LEVEL AFFECTS TRAUMA CENTER MANAGEMENT OF PELVIC RING INJURIES AND PATIENT MORTALITY
Presenter: Bryant Oliphant, MD, MBA — *Discussant*: Todd Costantini, MD

Paper 2 — ***8:20-8:40 am***
KETAMINE INFUSION FOR PAIN CONTROL IN ADULT PATIENTS WITH MULTIPLE RIB FRACTURES: RESULTS OF A RANDOMIZED CONTROLLED TRIAL
Presenter: Thomas Carver, MD — *Discussant*: David Spain, MD

Paper 3 — ***8:40-9:00 am***
CLEARING THE CERVICAL SPINE FOR PATIENTS WITH DISTRACTING INJURIES: AN AAST MULTI-INSTITUTIONAL TRIAL
Presenter: Abid Khan, MD — *Discussant*: Kenji Inaba, MD

Paper 4 — ***9:00-9:20 am***
THE EFFECTIVENESS OF THE 1994-2004 FEDERAL ASSAULT WEAPONS BAN IN CONTROLLING MASS SHOOTING DEATHS: ANALYSIS OF OPEN-SOURCE DATA
Presenter: Charles DiMaggio, MPH, PhD — *Discussant*: Ernest Moore, MD

Paper 5 — ***9:20-9:40 am***
NATIONWIDE ANALYSIS OF RESUSCITATIVE ENDOVASCULAR BALLOON OCCLUSION OF THE AORTA (REBOA) IN CIVILIAN TRAUMA.
Presenter: Bellal Joseph, MD — *Discussant*: Megan Brenner, MD, MSc

Paper 6 — ***9:40-10:00 am***
MORTALITY OUTLIER HOSPITALS AND IMPROVING THE QUALITY OF CARE IN EMERGENCY GENERAL SURGERY
Presenter: Robert Becher, MD — *Discussant*: Shahid Shafi, MD, MPH, MBA

Paper 7 ***10:00-10:20 am***

VARIATION IN MISSED READMISSIONS AFTER APPENDICITIS: NATIONAL ANALYSIS INCLUDING READMISSION TO A DIFFERENT HOSPITAL

Presenter: Rishi Rattan, MD *Discussant*: Christopher Dente, MD

Paper 8 ***10:20-10:40 am***

MANAGEMENT OF ADHESIVE SMALL BOWEL OBSTRUCTION: A DISTINCT PARADIGM SHIFT IN THE UNITED STATES

Presenter: Kazuhide Matsushima, MD *Discussant*: Martin Zielinski, MD

10:40-11:40 am

Session II: WTC Panel I

Hemorrhage Control for Complex Pelvic Fractures

Location: Seaport D-H, Second Level (Seaport Tower)

Moderator: Ingo Marzi, MD & Clay Cothren Burlew, MD

Panelists: Ingo Marzi, MD, *Role of Fixation*; Clay Cothren Burlew, MD, *Role of Pelvic Packing*; Ryosuke Usui, MD, *Role of Endovascular Techniques*

11:40-11:50 am Break

11:50 am-12:50 pm

Session III: AAST's Presidential Address

Execute on the Vision: Pyramids and Mirages in Shifting Sands

Location: Seaport D-H, Second Level (Seaport Tower)

Michael F. Rotondo, MD

University of Rochester Medical Center

1:00-2:15 pm

Session IV: AAST Lunch Sessions

LS I How to Plan a Successful Peer-Reviewed Manuscript: Avoiding Errors Before Submission

Location: Harbor A, Second Level (Harbor Tower)

LS II SBO: OR Before Sunset or Let the Sun Set?

Location: Harbor C, Second Level (Harbor Tower)

LS III Simulation Training for Civilian and Military Trauma: Advances and Challenges

Location: Coronado DE, Fourth Level (Harbor Tower)

LS IV Controversy or Common-Sense? Regionalization of Emergency General Surgery

Location: Harbor B, Second Level (Harbor Tower)

LS V Grassroots Legislative Advocacy: A Story is Worth 181 Votes or "The World is Run by Those Who Show Up"

Location: Coronado B, Fourth Level (Harbor Tower)

LS VI Post Intensive Care Syndrome (PICS), The Underappreciated ICU Morbidity

Location: Coronado A, Fourth Level (Harbor Tower)

2:00-2:15 pm Break

Location: Seaport Foyer

Session V: Trauma Systems

Papers 9-16

Moderator:
Martin Croce, MD

Recorder:
Robert Winchell, MD

Location:
Seaport D-H, Second Level (Seaport Tower)

Paper 9 ***2:15-2:35 pm***

SHOULD THEY STAY OR SHOULD THEY GO? WHO BENEFITS FROM INTERFACILITY TRANSFER TO A HIGHER LEVEL TRAUMA CENTER FOLLOWING INITIAL PRESENTATION FROM A LOWER LEVEL TRAUMA CENTER

Presenter: Christopher Tignanelli, MD *Discussant*: Jason Sperry, MD, MPH

Paper 10 ***2:35-2:55 pm***

DEVELOPMENT OF A GIS-BASED APPROACH FOR THE QUANTITATIVE ANALYSIS OF TRAUMA CENTER ACCESS

Presenter: Robert Winchell, MD *Discussant*: Frederick Rogers, MD

Paper 11 ***2:55-3:15 pm***

AVOIDING CRIBARI GRIDLOCK 2: THE STANDARDIZED TRIAGE ASSESSMENT TOOL (STAT) OUTPERFORMS THE CRIBARI MATRIX METHOD (CMM) - A REPLICATION STUDY IN 35 ADULT AND PEDIATRIC TRAUMA CENTERS.

Presenter: Jacob Roden-Foreman, BA *Discussant*: James Davis, MD

Paper 12 ***3:15-3:35 pm***

EFFECT OF DAMAGE CONTROL LAPAROTOMY ON MAJOR ABDOMINAL COMPLICATIONS AND LENGTHS OF STAY: A PROPENSITY SCORE MATCHING AND BAYESIAN ANALYSIS

Presenter: John Harvin, MD *Discussant*: Peter Rhee, MD, MPH

Paper 13 ***3:35-3:55 pm***

TRAUMA SYSTEM RESOURCE PRESERVATION: A SIMPLE SCENE TRIAGE TOOL CAN REDUCE HELICOPTER EMERGENCY MEDICAL SERVICES (HEMS) OVER-UTILIZATION IN A STATE TRAUMA SYSTEM

Presenter: Pascal Udekwu, MD, MBA *Discussant:* Mark Gestring, MD

Paper 14 ***3:55-4:15 pm***

LONG-TERM OUTCOMES AFTER SINGLE-LOOK TRAUMA LAPAROTOMY: A LARGE POPULATION-BASED STUDY

Presenter: Jason Bowie, MD *Discussant*: Adil Haider, MD, MPH

Paper 15 ***4:15-4:35 pm***

PRE-HOSPITAL TOURNIQUET USE IN PENETRATING EXTREMITY TRAUMA: DECREASED BLOOD TRANSFUSIONS AND LIMB COMPLICATIONS

Presenter: Alison Smith, MD, PhD *Discussant*: Joseph DuBose, MD

Paper 16 ***4:35-4:55 pm***

WHAT IS THE BEST SURGICAL MANAGEMENT FOR DUODENAL TRAUMA? A PANAMERICAN TRAUMA SOCIETY (PTS) MULTI-CENTERTRIAL

Presenter: Paula Ferrada, MD *Discussant*: Gregory Jurkovich, MD

5:00-6:00 pm

Session VI: WTC Panel II

Traumatic Coagulopathy: Is It All the Same?

Location: *Seaport D-H, Second Level (Seaport Tower)*

Moderator: Yasuhiro Otomo, MD, PhD and Mitchell Cohen, MD

Panelists: Radko Komadina, MD, *European Bleeding Guidelines*

DIC or Trauma-Induced Coagulopathy:

Western Perspectives: Bryan Cotton, MD Eastern Perspective: Yasuhiro Otomo, MD, PhD

5:00-7:30 pm Exhibit Hall Open

Location: Harbor D-I, Second Level (Harbor Tower)

6:00-7:30 pm

Session VII: AAST/WTC Posters

Location: Harbor D-I, Second Level (Harbor Tower)

Session I

Trauma Systems

Poster Professors: Brian Eastridge, MD and Joseph Rappold, MD

Session II

Neurotrauma

Poster Professors: Jose Pascual Lopez, MD and William Chiu, MD

Session III

REBOA

Poster Professors: Erik Barquist, MD and Joseph DuBose, MD

Session IV

Pediatric Trauma

Poster Professors: Richard Falcone, Jr., MD and David Nortrica, MD

Session V

Imaging

Poster Professors: Stephen Barnes, MD and Jay Doucet, MD, MSc

Session VI

Critical Care

Poster Professors: Pauline Park, MD and Christopher Michetti, MD

Session VII

Military

Poster Professors: Joseph Galante, MD and Jennifer Gurney, MD

Session VIII

Coagulation

Poster Professors: Grant Bochicchio, MD, MPH and Jay Johannigman, MD

Session IX

Geriatric

Poster Professors: Anne Mosenthal, MD and Jay Yelon, DO

Session X

Firearm/Prevention

Poster Professors: Kimberly Joseph, MD and Keith Clancy, MD, MBA

Session XI

EGS

Poster Professors: Marie Crandall, MD, MPH and Ajai Malhotra, MD

Session XII

Abdominal Injury

Poster Professors: Juan Duchesne, MD and Robert Mackersie, MD

Session XIII

Outcomes

Poster Professors: Daniel Holena, MD and Michel Aboutanos, MD

Session XIV

Torso Trauma

Poster Professors: David Livingston, MD and David Blake, MD, MPH

WTC Session I

International Trauma Care

Poster Professors: Peep Talving, MD and Walter Biffl, MD

WTC Session II

Challenging Cases from Around the World

Poster Professors: Marcelo Ribeiro, MD and Mayur Narayan, MD, MPH, MBA

7:00-8:15 pm — *JTACS* Editorial Board Meeting
Location: Harbor A, Second Level (Harbor Tower)

8:15-10:00 pm — *JTACS* Reception
(Invitation Only)
Location: Harbor Foyer and Terrace, Second Level (Harbor Tower)

Thursday 9/27

6:15-7:15 am — Medical Student/Resident/In-Training Fellow Breakfast
(registration required)
Speaker: Martin Croce, MD
Location: Coronado DE, Fourth Level (Harbor Tower)

6:15-7:15 am — Committee Meetings II

Acute Care Surgery Committee	*Cortez Hill, Third Level (Seaport Tower)*
Communications Committee	*Vista C, 32nd Level (Seaport Tower)*
Disaster Committee	*Cityview A, 32nd Level (Seaport Tower)*
Healthcare Economics Committee	*Cityview B, 32nd Level (Seaport Tower)*
International Relations Committee	*Vista A, 32nd Level (Seaport Tower)*
Pallative Care Ad Hoc Committee	*Skyline (32nd Floor, Seaport Tower)*
Pediatric Trauma Surgery Committee	*Vista B, 32nd Level (Seaport Tower)*

6:15-7:15 am

Session VIII: WTC I Sessions

Location: Coronado A, Fourth Level (Harbor Tower)

WTC 1: Resuscitation — *Australasian Trauma Society*
Moderators: John Cook-Jong Lee, MD, PhD and Michael Parr, MD
Keynote: Michael Parr, MD
Management of Traumatic Cardiac Arrest

Location: Seaport A-C, Second Level (Seaport Tower)

WTC 2: Quality — *Eastern Association for the Surgery of Trauma*
Moderators: Michel Aboutanos, MD and Bruce Crookes, MD
Keynote: Bruce Crookes, MD
Quality in Trauma Care: Navigating the Perfect Storm

Location: Hillcrest, Third Level (Seaport Tower)

WTC 3: Innovative Care — *Japanese Association for the Surgery of Trauma (JAST)*
Moderators: Hayato Kurihara, MD and Takahiro Kinoshita, MD
Keynote: Takahiro Kinoshita, MD
Hybrid ER

Location: Harbor C, Second Level (Harbor Tower)

WTC 4: Critical Care — *PanAmerican Trauma Society*
Moderators: Ajai Malhotra, MD and Akio Kimura, MD
Keynote: Thomas Scalea, MD
Acute Resuscitation Unit: Added Value Over ICU?

Location: Harbor B, Second Level (Harbor Tower)

WTC 5: Polytrauma/Ortho — *German Trauma Society (DGU)*
Moderators: Marius Keel, MD and Bertil Bouillon, MD
Keynote: Bertil Bouillon, MD
S3 Polytrauma Guideline Germany

Location: Harbor A, Second Level (Harbor Tower)

WTC 6: Geriatrics — *European Society for Trauma and Emergency Surgery (ESTES)*
Moderators: Ingo Marzi, MD and Christoph Josten, MD
Keynote: Christoph Josten, MD
The New Classification of Fragility Fractures of the Pelvis

Location: Coronado B, Fourth Level (Harbor Tower)

WTC 7: Emergency General Surgery — *World Society of Emergency Surgery (WSES)*
Moderators: Mauro Zago, MD and Salomone Di Saverio, MD
Keynote: Salomone Di Saverio, MD
Acute Appendicitis GL

7:00 am-3:00 pm — *Exhibits Open*
Location: Harbor D-I, Second Level (Harbor Tower)

7:00-8:30 am — Continental Breakfast in Exhibit Hall
Location: Harbor Ballroom, Second Level (Harbor Tower)

7:00 am-4:00 pm — Registration Open
Seaport Foyer - Second Level

7:00 am-5:00 pm — Donor Lounge Open
Location: Harbor Foyer, Second Level (Harbor Tower)

Session IX: Plenary Session

Papers 17-20

Moderator:
R. Lawrence Reed, MD

Recorder:
Preston Miller, MD

Location:
Seaport D-H, Second Level (Seaport Tower)

Paper 17 — ***7:30-7:50 am***
THE ECONOMIC FOOTPRINT OF ACUTE CARE SURGERY IN THE UNITED STATES: IMPLICATIONS FOR SYSTEMS DEVELOPMENT
Presenter: Kristan Staudenmayer, MD, MSc — *Discussant:* David Hoyt, MD

Paper 18 — ***7:50-8:10 am***
HOW MUCH GREEN DOES IT TAKE TO BE ORANGE? DETERMINING COST ASSOCIATED WITH TRAUMA CENTER READINESS
Presenter: Dennis Ashley, MD — *Discussant*: John Fildes, MD

Paper 19 — ***8:10-8:30 am***
MEDICAID EXPANSION ASSOCIATED WITH INCREASED ACCESS TO POST-DISCHARGE CARE FOR TRAUMA PATIENTS
Presenter: John Scott, MD, MPH — *Discussant*: Andrew Bernard, MD

Paper 20 — ***8:30-8:50 am***
ASSOCIATION BETWEEN LENGTH OF STAY AND ACCESS TO POST-ACUTE CARE: CHALLENGES WITH DISPOSITION AND THE IMPACT ON INPATIENT COSTS
Presenter: Lisa Knowlton, MD, MPH — *Discussant*: Jay Doucet, MD, MSc

8:50-10:00 am

Session X: AAST Panel

How Should We Position Acute Care Surgery in the Landscape of Healthcare Economics?
Location: Seaport D-H, Second Level (Seaport Tower)
Moderator: Joseph Minei, MD, MBA and Kristan Staudenmayer, MD, MSc
Panelists: Kristan Staudenmayer, MD, MSc; Joseph Minei, MD, MBA; Andrew Bernard, MD; Jay Doucet, MD, MSc
Topics: Setting the Stage - US Economics Trends
The Devil is in the Details
What is Affecting Our Practice Now
Local Economics- Advocating Value and Meeting Local Need

10:00-10:30 am

Session XI: Scholarship Presentations

Moderator: Michael F. Rotondo, MD
Location: Seaport D-H, Second Level (Seaport Tower)

10:30-10:45 am — Break in Exhibit Hall
Location: Harbor D-I, Second Level (Harbor Tower)

10:45-11:15 am **A Long Run for a Short Slide: A Story of Trauma Care in New Zealand**

Session XII: Master Surgeon Lecture I

Location: *Seaport D-H, Second Level (Seaport Tower)*
Presenter: Ian Civil, MD

11:15 am-12:15 pm **Pro/Con Debate**

Session XIII: WTC Panel III

Location: *Seaport D-H, Second Level*
Moderators: Ari Leppaniemi, MD, PhD and Zsolt Balogh, MD, PhD

Laparoscopy in Trauma
Pro: Selman Uranus, MD — *Con*: David Feliciano, MD

Grade IV Splenic Injury with Brush
Splenectomy: Andrew Peitzman, MD — *Angio/Embolization*: Federico Coccolini, MD

12:15-1:30 pm — Lunch in Exhibit Hall/Break
(Lunch available for purchase in Exhibit Hall)
Location: Harbor D-I, Second Level (Harbor Tower)

12:30-1:30 pm

Session XIV: WTC Power Sessions

Location: Coronado A, Fourth Level (Harbor Tower)

WTC PS1 **How Good Can Highly Performing Trauma Systems Get?**

Sponsored by Australasian Trauma Society
Panelists:

- Michael Parr, MD
- Ian Civil, MD
- Zsolt Balogh, MD, PhD
- Li Hsee, MD

Location: Coronado DE, Fourth Level, (Harbor Tower)

WTC PS2 **Understanding EAST Practice Management Guidelines and Practical Tips to Adapting at your Hospital**

Moderator: Elliot Haut, MD, PhD

Sponsored by Eastern Association for the Surgery of Trauma
Panelists:

- Elliott Haut, MD, PhD, A 20-year history of EAST's Practice Management Guidelines
- John Como, MD, Current Role of EAST's Practice Management Guidelines
- Nicole Fox, MD, MPH, Evaluation and Management of Blunt Trauma Aortic Injury: An EAST PMG
- Mayur Patel, MD, MPH, Cervical Spine Collar Clearance in the Obtunded Adult Blunt Trauma Patient: An EAST PMG

Location: Coronado B, Fourth Level (Harbor Tower)

WTC PS3 **DCIR and REBOA**

Sponsored by Japanese Association for the Surgery of Trauma (JAST)
Panelists:

- Tomohiro Funabiki, MD, PhD, What is DCIR? (Damage Control Interventional Radiology)
- Yosuke Matsumura, MD, PhD, Small profile, partial occlusion, undelayed but short occlusion: REBOA registry in Japan
- Taichiro Tsunoyama, MD, PhD, Review of all cases using REBOA: A single-center expericne from Tokyo for five years
- Takayuki Ogura, MD, PhD, Traumatic bleeding severity score (TBSS) guided initiation of REBOA as a Damage Control Strategy; for the right patient, at the right timing, and in the right way

Location:
Golden Hill, Third Level
(Seaport Tower)

WTC PS4 **ACS Education Program in Asia (JSACS/KSACS)**

Sponsored by the Japanese Society for Acute Care Surgery/The Korean Society for Acute Care Surgery

Panelists:

- Jae Hun Kim, MD, ACS Resident Program in Korea
- Yashurio Otomo, MD, PhD, ACS Board Certified Surgeon in Japan
- Tay Wee Ming, MD, ACS Training program in Singapore
- LI-Chien Chien, MD, ACS Program in Taiwan

Location:
Harbor B, Second Level
(Harbor Tower)

WTC PS5 **Hot Topics in Trauma**

Sponsored by SBAIT - Brazilian Trauma Society

Panelists:

- Marcelo Ribeiro,MD, Enteroatmospheric Fistula Management
- Diogo Garcia, MD, Rib Fixation
- Carlos Menegozzo, MD, Laparoscopy in Trauma
- Jose Cruvinel, MD, Thoracoscopy in Trauma

Location:
Harbor A, Second Level
(Harbor Tower)

WTC PS6 **How to Organize Trauma Care in the ICU**

Sponsored by ESTES/IATSIC Moderator: Kenneth Boffard, MD

Panelists:

- Felco Hietbrink, MD, Intermediate care, cost effective alternative for ICU care in Selected Patients
- Karen Brasel, MD, MPH, Trauma ICU in the USA - the role of the surgeon
- Christine Gaarder, MD, PhD, Is There A Role for the Trauma Surgeon in ICU in European Closed ICU?
- Kenneth Boffard, MD, Is ICU Viable in a Developing Country? Best for the most?

Location:
Harbor C, Second Level
(Harbor Tower)

WTC PS7 **Did You Think You Had Seen It All? Unusual Cases and Discussions with Panel (You May Be On It)**

Sponsored by ESTES/IATSIC Moderator: Scott D'Amours, MD

Panelists:

- Steven Moeng, MD
- Scott D'Amours, MD
- Peep Talving, MD

Location:
Seaport A-C, Second Level
(Seaport Tower)

WTC PS8 **Short Clinical Updates by the Experts: What is New and Important**

Sponsored by ESTES/IATSIC Moderator: Luke Leenen, MD, PhD

Panelists:

- Paal Naess, MD, PhD, Pelvic Injuries - the role for EPP?
- Adam Brooks, MD, Pancreatic Injuries - to resect or not?
- Luke Leenen, MD, PhD, Chest Injuries - to fixate or not?
- Rajan Gupta, MD, DCS in Trauma - Under vs Overuse?
- David Zonies, MD,MPH, Role of ECMO in Trauma in the Future
- Martin Schreiber, MD, Thromboprophylaxis In Trauma - Drug, Dosing, Do We Know What We Are Doing?

Location:
Hillcrest, Third Level (Seaport Tower)

WTC PS9 **The Impact of Big Data and Artificial Intelligence on Trauma Care**

Sponsored by Chang Gung Memorial Hospital *Moderator: Chi-Hsun Hsieh, MD, PhD*

Panelists:

- Chih-Yuan Fu, MD
- Chien-Hung Liao, MD
- Ling-Wei, MD

Session XVA: Parallel Session

Papers 21-29

Moderator:
Deborah Kuhls, MD

Recorder:
Christine Cocanour, MD

Location:
Seaport D-H, Second Level (Seaport Tower)

Paper 21 ***1:30-1:50 pm***
PEDIATRIC FIREARM INCIDENTS: IT'S TIME TO DECREASE ON-SCENE MORTALITY
Presenter: Jessica Friedman, MD *Discussant*: L.R. Tres Scherer, MD

Paper 22 ***1:50-2:10 pm***
EFFECT OF MASS SHOOTINGS ON GUN SALES – A 20 YEAR PERSPECTIVE
Presenter: Rachael Callcut, MD, MSPH *Discussant*: Ronald Stewart, MD

Paper 23 ***2:10-2:30 pm***
INCREASINGLY PERMISSIVE FIREARM CARRY LEGISLATION IS ASSOCIATED WITH INCREASED FIREARM-RELATED SUICIDE RATES
Presenter: Matthew Hernandez, MD *Discussant*: Zara Cooper, MD, MSc

Paper 24 ***2:30-2:50 pm***
COMPARISON OF MALE AND FEMALE VICTIMS OF INTIMATE PARTNER HOMICIDE IN OPPOSITE SEX RELATIONSHIPS - AN ANALYSIS OF THE NATIONAL VIOLENT DEATH REPORTING SYSTEM
Presenter: Catherine Velopulos, MD, MHS *Discussant*: D'Andrea Joseph, MD

Paper 25 ***2:50-3:10 pm***
ESSENTIAL VIOLENCE INTERVENTION RESOURCES: AN UPDATE USING THE NATIONAL NETWORK OF HOSPITAL-BASED VIOLENCE INTERVENTION PROGRAM'S MULTI-INSTITUTIONAL DATABASE
Presenter: Rochelle Dicker, MD *Discussant*: Amy Goldberg, MD

Paper 26 ***3:10-3:30 pm***
THE GATE PROGRAM: A MULTIDISCIPLINARY INTERVENTION TO REDUCE JUVENILE GUN VIOLENCE RECIDIVISM AND POTENTIAL MODEL FOR NATIONWIDE EXPANSION
Presenter: Hahn Soe-Lin, MD, MS *Discussant*: Rochelle Dicker, MD

Paper 27 ***3:30-3:50 pm***
USE OF SHOTSPOTTERTM DETECTION TECHNOLOGY DECREASES TRANSPORT TIME FOR PATIENTS SUSTAINING GUNSHOT WOUNDS
Presenter: Deviney Rattigan, MD *Discussant*: Alexander Eastman, MD, MPH

Paper 28 ***3:50-4:10 pm***
OBSERVING PNEUMOTHORACES: THE 35 MM RULE IS SAFE FOR BOTH BLUNT AND PENETRATING CHEST TRAUMA
Presenter: Savo Bou Zein Eddine, MD *Discussant*: Andrew Kirkpatrick, MD

Paper 29 ***4:10-4:30 pm***
TO SLEEP, PERCHANCE TO DREAM: ACUTE AND CHRONIC SLEEP DEPRIVATION IN ACUTE CARE SURGEONS
Presenter: Jamie Coleman, MD *Discussant*: Nicole Stassen, MD

Session XVB: Basic Science

Papers 30-38

Moderator:
Suresh Agarwal, MD

Recorder:
Marc deMoya, MD

Location:
Seaport A-C, Second Level (Seaport Tower)

Paper 30 ***1:30-1:50 pm***
DOES A LUNG INFECTION AFTER BRAIN INJURY WORSEN EARLY BRAIN INFLAMMATION AND SUBSEQUENT NEUROLOGICAL RECOVERY?
Presenter: Christina Jacovides, MD *Discussant*: Deborah Stein, MD, MPH

Paper 31 ***1:50-2:10 pm***
ELECTROPORATION-MEDIATED LUNG GENE TRANSFER OF HUMAN FELINE SARCOMA RELATED (FER) TYROSINE-KINASE MOBILIZES TOLL-LIKE RECEPTOR-4 GRANULO-MONOCYTES AND IMPROVES SURVIVAL IN MURINE MODEL OF PSEUDOMONAS AERUGINOSA PNEUMONIA
Presenter: David Machado-Aranda, MD *Discussant*: James Hoth, MD

Paper 32 ***2:10-2:30 pm***
RED BLOOD CELL STORAGE AND ADHESION TO VASCULAR ENDOTHELIUM UNDER NORMAL OR STRESS CONDITIONS: AN IN VITRO MICROFLUIDIC STUDY
Presenter: Lawrence Diebel, MD *Discussant*: Rosemary Kozar, MD, PhD

Paper 33 ***2:30-2:50 pm***
TRANEXAMIC ACID SUPPRESSES THE RELEASE OF MITOCHONDRIAL DAMPS AND REDUCES LUNG INFLAMMATION IN A MURINE BURN MODEL
Presenter: Damien Carter, MD *Discussant*: Carl Hauser, MD

Paper 34 ***2:50-3:10 pm***
ENDOTHELIAL CELL DYSFUNCTION DURING ANOXIA-REOXYGENATION IS ASSOCIATED WITH A DECREASE IN ATP LEVELS, REARRANGEMENT IN LIPID BILAYER PHOSPHATIDYLSERINE ASYMMETRY, AND AN INCREASE IN ENDOTHELIAL CELL PERMEABILITY
Presenter: Javid Sadjadi, MD *Discussant*: Timothy Pritts, MD

Paper 35 ***3:10-3:30 pm***
SELECTIVE AORTIC ARCH PERFUSION WITH FRESH WHOLE BLOOD OR HBOC-201 EFFECTIVELY REVERSES HEMORRHAGE-INDUCED TRAUMATIC CARDIAC ARREST IN A LETHAL MODEL OF NON-COMPRESSIBLE TORSO HEMORRHAGE
Presenter: Heather Hoops, MD *Discussant*: Samuel Tisherman, MD

Paper 36 ***3:30-3:50 pm***
DOES BLOOD TRANSFUSION PRESERVE THE GUT MICROBIOME (GM) AFTER TRAUMA? A PROSPECTIVE, CLINICAL STUDY IN SEVERELY INJURED PATIENTS
Presenter: Susannah Nicholson, MD, Msci *Discussant*: Mitchell Cohen, MD

Paper 37 ***3:50-4:10 pm***
PRECIOUS CARGO: NEURO-ENTERIC MODULATION OF THE MESENTERIC LYMPH EXOSOME PAYLOAD AFTER HEMORRHAGIC SHOCK
Presenter: Elliott Williams, MD *Discussant*: Jason Smith, MD

Paper 38 ***4:10-4:30 pm***
ACUTE RESUSCITATION WITH POLYETHYLENE GLYCOL-20K: A THROMBOELASTOGRAPHIC ANALYSIS
Presenter: Niluka Wickramaratne, MD, BS *Discussant*: Jeremy Cannon, MD

4:45-5:45 pm

Session XVI: WTC II Sessions

Location: Seaport A-C, Second Level (Seaport Tower)

WTC 8: Research *Sponsored by European Society for Trauma and Emergency Surgery (ESTES)*

Moderators: Ronald Maier, MD and Ingo Marzi, MD
Keynote: Bertil Bouillon, MD
Influence of Trauma Registry Data on Basic Research

Location: Coronado A, Fourth Level (Harbor Tower)

WTC 9: Shock/Transfusion *Sponsored by The Japanese Society for Acute Care Surgery (JSACS)*

Moderators: Ernest Moore, MD and Yasuhiro Otomo, MD, PhD
Keynote: Yasuhiro Otomo, MD, PhD
Traumatic Coagulopathy

Location: Harbor B, Fourth Level (Harbor Tower)

WTC 10:Prevention/Outcomes *Sponsored by SBAIT - Brazilian Trauma Society*

Moderators: Rochelle Dicker, MD and Gustavo Fraga, MD, PhD
Keynote: Gustavo Fraga, MD, PhD
"Yellow May" - Trauma Prevention Program

Location: Coronado B, Fourth Level (Harbor Tower)

WTC 11: Trauma Systems *Sponsored by Chinese Medical Doctor Association Trauma Committee (CMDATC)*

Moderators: Marc deMoya, MD and Xiao-Bing Fu, MD
Keynote: Zhanfei Li, MD, PhD
Trauma System Development in China

Location: Coronado DE, Fourth Level (Harbor Tower)

WTC 12: Thoracic/Vascular *Sponsored by Austrian Council for Emergency Medicine (AGN)*

Moderators: Luke Leenen, MD, PhD and Paul Puchwein, MD
Keynote: Paul Puchwein, MD
Emergency Thoracotomy in Preclinical Setting- An Advantage of Physician Based EMS

Location: Harbor A, Fourth Level (Harbor Tower)

WTC 13: Emergency General Surgery *Sponsored by WSES*

Moderators: Carlos Mesquita, MD and Federico Coccolini, MD
Keynote: Federico Coccolini, MD
Acute Cholecystsitis GL

6:30 pm-9:30 pm San Diego Night (USS Midway) - Ticketed Event
Location: USS Midway (910 N Harbor Dr, San Diego, CA)

Friday 9/28

6:15-7:15 am	Committee Meetings - Session III
ACS Program Directors Committee Meeting	*Vista A, 32nd Level (Seaport Tower)*
Education/CME Committee	*Vista B, 32nd Level (Seaport Tower)*
Military Liaison Committee	*Skyline, 32nd Level (Seaport Tower)*
Multi-Institutional Trials Committee	*Cityview B, 32nd Level (Seaport Tower)*
Prevention Committee	*Cityview A, 32nd Level (Seaport Tower)*
Reimbursement/Coding Committee	*Vista C, 32nd Level (Seaport Tower)*

6:15-7:15 am

Session XVII: WTC III Sessions

Location: Harbor A, Second Level (Harbor Tower)

WTC 14: Critical Care *Sponsored by Australasian Trauma Society*

Moderators: Koji Morishita, MD and Zsolt Balogh, MD, PhD

Keynote: Zsolt Balogh, MD, PhD

Understanding Post Injury Inflammation for Better Timing of Definitive Surgical Intervention in Polytrauma

Location: Harbor C, Second Level (Harbor Tower)

WTC 15: Prevention *Sponsored by Eastern Association for the Surgery of Trauma (EAST)*

Moderators: Jose Mauro da Silva Rodrigues, MD and Nicole Stassen, MD

Keynote: Nicole Stassen, MD

A New Frontier in Firearm Injury

Location: Seaport A-C, Second Level (Seaport Tower)

WTC 16: Abdominal Trauma *Sponsored by European Society for Trauma and Emergency Surgery (ESTES)*

Moderators: Jungchui Kim, MD and Ari Leppaniemi, MD, PhD

Keynote: Ari Leppaniemi, MD, PhD

Nonoperative Management of Solid Abdominal Organ Injuries

Location: Coronado DE, Fourth Level (Harbor Tower)

WTC 17: Guidelines/Outcomes *Sponsored by European Society for Trauma and Emergency Surgery (ESTES)*

Moderators: Yoshinori Murao, MD and Rado Komadina, MD

Keynote: Radko Komadina, MD

European Bleeding Guidelines

Location: Harbor B, Second Level (Harbor Tower)

WTC 18: Education *Sponsored by SBAIT - Brazil Trauma Society*

Moderators: Mamta Swaroop, MD and Gustavo Fraga, MD, PhD

Keynote: Gustavo Fraga, MD, PhD

Trauma Leagues: A Novel Option to Attract Medical Students to a Surgical Career

Location: Coronado A, Fourth Level (Harbor Tower)

WTC 19: Geriatrics/Outcomes *Sponsored by Japanese Association for the Surgery of Trauma (JAST)*

Moderators: Amit Gupta, MD, and Takashi Fujita, MD

Keynote: Takashi Fujita, MD

Geriatric Trauma in Japan

Location:
Coronado B, Fourth Level
(Harbor Tower)

WTC 20: Shock Resuscitation *Sponsored by The Japanese Society for Acute Care Surgery (JSACS)*

Moderators: Sandro Rizoli, MD, PhD, and Shigeki Kushimoto, MD
Keynote: Shigeki Kushimoto, MD
Traumatic Coagulopathy

7:00-8:30 am Continental Breakfast
Location: Harbor D-I, Second Level (Harbor Tower)

7:00 am-2:00 pm Exhibits Open
Location: Harbor D-I, Second Level (Harbor Tower)

7:00 am-3:00 pm Registration Open
Location: Seaport Foyer, Second Level (Seaport Tower)

7:00 am-4:00 pm Donor Lounge Open
Location: Harbor Foyer, Second Level (Harbor Tower)

Session XVIII: Coagulation Session
Papers 39-44

Moderator:
Martin Schreiber, MD

Recorder:
Sharon Henry, MD

Location:
Seaport D-H, Second Level (Seaport Tower)

Paper 39 ***7:30-7:50 am***
MICROVESICLES GENERATED FOLLOWING TRAUMATIC BRAIN INJURY INDUCE PLATELET DYSFUNCTION VIA ADP RECEPTOR
Presenter: Grace Martin, MD *Discussant*: John Holcomb, MD

Paper 40 ***7:50-8:10 am***
GUIDELINE-BASED CORRECTION OF PLATELET INHIBITION IN TBI PATIENTS IS ASSOCIATED WITH IMPROVED MORTALITY
Presenter: Andrew Sorah, MD *Discussant*: Michael Cripps, MD

Paper 41 ***8:10-8:30 am***
PLATELET DERIVED EXTRACELLULAR VESICLES ARE EQUIVALENT TO PLATELETS WITH RESPECT TO HEMOSTASIS AND VASCULAR PERMEABILITY
Presenter: Shibani Pati, MD, PhD *Discussant*: Susan Evans, MD

Paper 42 ***8:30-8:50 am***
TRANEXAMIC ACID AS A RISK FACTOR FOR POST-TRAUMATIC VENOUS THROMBOEMBOLISM: RESULTS FROM A PROPENSITY MATCHED COHORT STUDY
Presenter: Sara Myers, MD, MA, MS *Discussant*: Adrian Maung, MD

Paper 43 ***8:50-9:10 am***
4-FACTOR PROTHROMBIN COMPLEX CONCENTRATE IMPROVES SURVIVAL IN TRAUMA: A NATIONWIDE PROPENSITY MATCHED ANALYSIS
Presenter: Muhammad Zeeshan, MD *Discussant*: Matthew Martin, MD

Paper 44 ***9:10-9:30 am***

DESMOPRESSIN IS A TRANSFUSION SPARING OPTION TO REVERESE PLATELET DYSFUNCTION IN PATIENTS WITH SEVERE TRAUMATIC BRAIN INJURY

Presenter: Elisa Furay, MD *Discussant*: Susan Rowell, MD

9:30-9:45 am Break

Location: Harbor D-I, Second Level (Harbor Tower)

Session XIX: Coagulation
Papers 45-47

Moderator: Raminder Nirula, MD, PhD

Recorder: Oscar Guillamondegui, MD, MPH

Location: Seaport D-H, Second Level (Seaport Tower)

Paper 45 ***9:45-10:05 am***

A NOVEL PLATELET FUNCTION ASSAY FOR TRAUMA

Presenter: Mitchell George, MD *Discussant*: Jordan Weinberg, MD

Paper 46 ***10:05-10:25 am***

TRANEXAMIC ACID CAUSES A ROBUST AND PROLONGED FIBRINOLYTIC SHUTDOWN

Presenter: Julia Coleman, MD, MPH *Discussant*: Nicholas Namias, MD, MBA

Paper 47 ***10:25-10:45 am***

EARLY FIBRINOLYSIS SHUTDOWN IS ASSOCIATED WITH INCREASED NEUROSURGICAL INTERVENTIONS AFTER TRAUMATIC BRAIN INJURY: IS SHUTDOWN AN EARLY MARKER OF HYPOCOAGULABILITY RATHER THAN HYPOFIBRINOLYSIS?

Presenter: Johana Gomez-Builes, MD *Discussant*: Martin Schreiber, MD

10:55-11:55 am **Damage Control and Firearm Deaths: "A Tale of Two Cities!"**

Session XX: Fitts Lecture

Location: Seaport D-H, Second Level (Seaport Tower)

Pesenter: C. William Schwab, MD

12:00-1:15 pm

Session XXI: AAST Lunch Sessions

LS VII Establishing a Translational Research Career in Acute Care Surgery: Early, Mid-, and Late Career Milestones

Location: Coronado A, Fourth Level (Harbor Tower)

LS VIII The Opioid Epidemic: Challenges for Acute Care Surgeons

Location: Coronado B, Fourth Level (Harbor Tower)

LS IX TXA Beyond CRASH2 - Controversies and the Global Perspective

Location: Coronado DE, Fourth Level (Harbor Tower)

LS X Physician Resilience, Burnout and the Work Life Balance

Location: Harbor A, Second Level (Harbor Tower)

LS XI Palliative Care 2018: Implementing the TQIP Best Practice Guideline

Location: Harbor B, Second Level (Harbor Tower)

LS XII The Difficult Cholexystectomy

Location: Harbor C, Second Level (Harbor Tower)

1:15-1:30 pm Break in Exhibit Hall

Location: Harbor D-I, Second Level (Harbor Tower)

1:30-2:00 pm

Session XXII: Master Surgeon Lecture II

Advise, Advance, Support, Teach - the True Meaning of AAST to Me

Location: Seaport D-H, Second Level (Seaport Tower)

Presenter: Christine Gaarder, MD, PhD

Session XXIIIA: Plenary Papers

Papers 48-56

Moderator:
Christoph Josten, MD

Recorder:
Andre Campbell, MD

Location:
Seaport D-H, Second Level (Seaport Tower)

Paper 48 ***2:00-2:20 pm***

A NOMOGRAM PREDICTING THE NEED FOR BLEEDING INTERVENTIONS AFTER HIGH-GRADE RENAL TRAUMA: RESULTS FROM THE AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA (AAST) GENITOURINARY TRAUMA STUDY

Presenter: Sorena Keihani, MD *Discussant*: Neil Perry, MD

Paper 49 ***2:20-2:40 pm***

PRESUMPTIVE ANTIBIOTICS FOR TUBE THORACOSTOMY FOR TRAUMATIC HEMOPNEUMOTHORAX

Presenter: Susan Schultz, MD *Discussant*: Timothy Fabian, MD

Paper 50 ***2:40-3:00 pm***

VASOPRESSOR USE IN SPINAL CORD INJURY INCREASES MORTALITY AND COMPLICATIONS WITHOUT IMPROVING SHORT TERM NEUROLOGIC FUNCTION

Presenter: Caitlin Fitzgerald, MD *Discussant*: David Zonies, MD, MPH

Paper 51 ***3:00-3:20 pm***

PREHOSPITAL END TIDAL CO2: A SUPERIOR MARKER FOR MORTALITY RISK IN THE ACUTELY INJURED PATIENT

Presenter: Robert Willis, MD, MS *Discussant*: Saman Arbabi, MD, MPH

Paper 52 ***3:20-3:40 pm***

PRE-INJURY PALLIATIVE PERFORMANCE SCALE (PPS) PREDICTS FUNCTIONAL OUTCOMES AT 6 MONTHS IN OLDER TRAUMA PATIENTS

Presenter: Franchesca Hwang, MD *Discussant*: Karen Brasel, MD, MPH

Paper 53 ***3:40-4:00 pm***

USING PERFORMANCE FRONTIERS TO DIFFERENTIATE ELECTIVE AND CAPACITY-BASED SURGICAL SERVICES

Presenter: Stephen Ranney, MD *Discussant*: Kimberly Davis, MD, MBA

Paper 54 ***4:00-4:20 pm***

MINIMALLY INVASIVE PREPERITONEAL BALLOON TAMPONADE AND ABDOMINAL AORTIC JUNCTIONAL TOURNIQUET VERSUS OPEN PACKING FOR PELVIC FRACTURE-ASSOCIATED HEMORRHAGE: NOT ALL EXTRINSIC COMPRESSION IS EQUAL

Presenter: Woo Do, MD *Discussant*: Clay Cothren Burlew, MD

Paper 55 ***4:20-4:40 pm***

OUTCOMES FOR POPLITEAL ARTERY INJURY REPAIR AFTER DISCHARGE: A LARGE-SCALE POPULATION-BASED ANALYSIS

Presenter: William Butler, MD *Discussant*: David Feliciano, MD

Paper 56 ***4:40-5:00 pm***
WITHDRAWN

Session XXIIIB: Plenary Papers

Papers 57-65

Moderator:
M. Margaret Knudson, MD

Recorder:
Addison May, MD

Location:
Seaport A-C, Second Level (Seaport Tower)

Paper 57 ***2:00-2:20 pm***
APPLICATION OF EMR-DERIVED ANALYTICS IN CRITICAL CARE: ROTHMAN INDEX PREDICTS MORTALITY AND READMISSIONS IN SURGICAL ICU PATIENTS
Presenter: Abdul Alarhaeym, MD *Discussant*: Sonlee West, MD

Paper 58 ***2:20-2:40 pm***
PREDISPOSED TO FAILURE? THE CHALLENGE OF RESCUE IN THE MEDICAL INTENSIVE CARE UNIT
Presenter: Alexandra Briggs, MD *Discussant*: Lena Napolitano, MD, MPH

Paper 59 ***2:40-3:00 pm***
ULTRASONGRAPHIC IVC DIAMETER RESPONSE AFTER ONE HOUR OF TRAUMA RESUSCITATION PREDICTS 24 HOUR FLUID REQUIREMENT
Presenter: Jay Doucet, MD, MSc *Discussant*: Grace Rozycki, MD, MBA

Paper 60 ***3:00-3:20 pm***
VENTILATOR ASSOCIATED EVENT, NOT VENTILATOR ASSOCIATED PNEUMONIA, IS A TRUE QUALITY INDICATOR
Presenter: Ashley Meagher, MD, MPH *Discussant*: Martin Croce, MD

Paper 61 ***3:20-3:40 pm***
TRAUMA ICU PREVALENCE PROJECT (TRIPP): THE PHENOTYPE OF A TRAUMA ICU. AN AAST MULTI-INSTITUTIONAL STUDY
Presenter: Christopher Michetti, MD *Discussant*: Bryce Robinson, MD, MSc

Paper 62 ***3:40-4:00 pm***
TWENTY-FOUR HOUR VERSUS EXTENDED ANTIBIOTIC ADMINISTRATION AFTER SURGERY IN COMPLICATED APPENDICITIS: A RANDOMIZED CONTROLLED TRIAL
Presenter: Sten Saar, MD *Discussant*: Robert Sawyer, MD

Paper 63 ***4:00-4:20 pm***
P-SELECTIN IS CRITICAL FOR DE NOVO PULMONARY ARTERIAL THROMBOSIS FOLLOWING BLUNT THORACIC TRAUMA
Presenter: Linda Schutzman, MD *Discussant*: Alicia Mohr, MD

Paper 64 ***4:20-4:40 pm***
HIGH PERFORMANCE EMERGENCY GENERAL SURGERY HOSPITALS: GOOD AT ONE OPERATION, GOOD AT THEM ALL
Presenter: Michael DeWane, MD *Discussant*: Avery Nathens, MD, PhD, MPH

Paper 65 ***4:40-5:00 pm***

THE EGS GRADING SCALE FOR SKIN AND SOFT TISSUE INFECTIONS IS PREDICTIVE OF POOR OUTCOMES : AN AAST MULTI-CENTER VALIDATION STUDY

Presenter: Stephanie Savage, MD, MS *Discussant*: Eileen Bulger, MD

5:00-6:30 pm AAST Business Meeting (AAST Members Only)
Location: Seaport A-C, Second Level (Seaport Tower)

5:00-6:30 pm

Session XXIV: WTC IV Sessions

Location:
Golden Hill, Third Level
(Seaport Tower)

WTC 21: Abdominal Trauma *Sponsored by SBAIT - Brazilian Trauma Society*

Moderators: Gennaro Perrone, MD and Tercio Campos, MD
Keynote: Tercio Campos, MD
Pancreatic Trauma

Location:
Torrey Hill, Third Level
(Seaport Tower)

WTC 22: Shock/Resuscitation *Sponsored by The Japanese Society for Acute Care Surgery (JSACS)*

Moderators: Christine Gaarder, MD, PhD and Atsushi Shiraishi, MD
Keynote: Atsushi Shiraishi, MD
The Effects of TXA on Trauma

Location:
La Jolla, Second Level
(Seaport Tower)

WTC 23: Trauma Education *Sponsored by Chinese Medical Doctor Association Trauma Committee (CMDATC)*

Moderators: Ashok Puranik, MD and Lian-Yang Zhang, MD
Keynote: Guixi Zhang, MD, MBBS, MHSM, MSc
Trauma Education in China

Location:
Old Town, Second Level
(Seaport Tower)

WTC 24: Prehospital *Sponsored by JSACS/KSACS*

Moderators: Susan Brundage, MD and John Cook-Jong Lee, MD, PhD
Keynote: John Cook-Jong Lee, MD, PhD
Invasive Prehospital Care

7:30-11:00 pm Reception and Banquet
Location: Seaport Foyer and Seaport D-H, Second Level (Seaport Tower)

Saturday 9/29

7:00-8:00 am — New Member Breakfast
Location: La Jolla, Second Level (Seaport Tower)

7:30-9:00 am — Continental Breakfast
Location: Seaport Foyer, Second Level (Seaport Tower)

7:30-10:00 am — Registration Open (if needed)
Location: Seaport Foyer, Second Level (Seaport Tower)

Session XXV: Plenary Papers
Papers 66-68

Moderator:
Eric Toschlog, MD

Recorder:
Thomas Esposito, MD, MPH

Location:
Seaport A-C, Second Level (Seaport Tower)

Paper 66 — ***8:00-8:20 am***
RESILIENCE AND LONG-TERM OUTCOMES AFTER TRAUMA: AN OPPORTUNITY FOR EARLY INTERVENTION?
Presenter: Deepika Nehra, MD — *Discussant*: Ben Zarzaur, Jr., MD

Paper 67 — ***8:20-8:40 am***
CORRELATION OF ON-CALL TRAUMA SURGEON FATIGUE FLUCTUATIONS WITH BURNOUT RISK AND SURGICAL SKILL PERFORMANCE
Moderator: Brittany Lisjak, PA-C — *Discussant*: Heena Santry, MD

Paper 68 — ***8:40-9:00 am***
STOP FLAILING: THE IMPACT OF BICORTICALLY DISPLACED RIB FRACTURES ON PULMONARY OUTCOMES IN PATIENTS WITH CHEST TRAUMA - AN AAST MITC STUDY
Presenter: Lara Senekjian, MD, Msci — *Discussant:* Frederic Pieracci, MD, MPH

Session XXVI: Quickshot I
1-13

Moderator:
Roxie Albrecht, MD

Location:
Seaport A-C, Second Level (Seaport Tower)

Quickshot 1 — ***9:00-9:06 am***
THE ACA AND EMERGENCY GENERAL SURGERY CHOLECYSTECTOMIES
Presenter: Laura Godat, MD — *Discussant*: Lance Stuke, MD, MPH

Quickshot 2 — ***9:06-9:12 am***
EMERGENCY GENERAL SURGERY IN GERIATRIC PATIENTS: HOW SHOULD WE EVALUATE HOSPITAL EXPERIENCE?
Presenter: Ambar Mehta, MPH — *Discussant*: Jody DiGiacomo, MD

Quickshot 3 — ***9:12-9:18 am***
THE ACUTE ABDOMEN: FASTER AND SAFER WITH ACUTE CARE SURGERY
Presenter: David Jeffcoach, MD — *Discussant*: Brandon Bruns, MD

Quickshot 4 — ***9:18-9:24 am***
OUTCOMES IN ADHESIVE SMALL BOWEL OBSTRUCTION FROM A LARGE STATEWIDE DATABASE: WHAT TO EXPECT AFTER NON-OPERATIVE MANAGEMENT
Presenter: Lyndsey Wessels, MD — *Discussant*: Jose Diaz, MD

Quickshot 5 — ***9:24-9:30 am***
EGS PRESENTS GREATER FINANCIAL RISK THAN TRAUMA
Presenter: Andrew Bernard, MD — *Discussant*: Oliver Gunter, MD

Quickshot 6 ***9:30-9:36 am***

QUANTIFYING THE THOUSANDS OF LIVES LOST DUE TO POOR EMERGENCY GENERAL SURGERY (EGS) OUTCOMES: WHY WE NEED A NATIONAL EGS QUALITY IMPROVEMENT PROGRAM

Presenter: Zain Hashmi, MBBS *Discussant*: Angela Ingraham, MD

Quickshot 7 ***9:36-9:42 am***

IMPACT OF A SIMPLIFIED MANAGEMENT ALGORITHM ON OUTCOME FOLLOWING EXSANGUINATING PELVIC FRACTURES: A 10-YEAR EXPERIENCE

Presenter: Richard Lewis, MD, MA *Discussant*: David Morris, MD

Quickshot 8 ***9:42-9:48 am***

BLUNT SMALL BOWEL PERFORATION (SBP): A MULTICENTER UPDATE 15 YEARS LATER

Presenter: Samir Fakhry, MD *Discussant*: Stephen Gale, MD

Quickshot 9 ***9:48-9:54 am***

THE NEED FOR TRAUMA INTERVENTION (NFTI) DEFINES MAJOR TRAUMA MORE ACCURATELY THAN INJURY SEVERITY SCORE (ISS) AND REVISED TRAUMA SCORE (RTS): DATA FROM A COLLABORATION OF 35 ADULT AND PEDIATRIC TRAUMA CENTERS.

Presenter: Michael Foreman, MD *Discussant*: William Hoff, MD

Quickshot 10 ***9:54-10:00 am***

DIAGNOSIS OF DIAPHRAGM INJURIES USING MODERN 256 SLICE CT SCANNERS: TOO EARLY TO ABANDON OPERATIVE EXPLORATION

Presenter: Rindi Uhlich, MD *Discussant*: David Skarupa, MD

Quickshot 11 ***10:00-10:06 am***

HOW SAFE AND EFFECTIVE ARE SMALL-BORE CHEST TUBES AT MANAGING DELAYED HEMOTHORACES COMPARED TO LARGE-BORE CHEST TUBES?

Presenter: John Cordero, MD *Discussant*: Ali Salim, MD

Quickshot 12 ***10:06-10:12 am***

COMPARISON OF 7 AND 11-12 FRENCH ACCESS FOR REBOA: RESULTS FROM THE AAST AORTIC OCCLUSION FOR RESUSCITATION IN TRAUMA AND ACUTE CARE SURGERY (AORTA) REGISTRY

Presenter: Joseph DuBose, MD *Discussant*: Michael Sise, MD

Quickshot 13 ***10:12-10:18 am***

THE IMPACT OF IN-HOSPITAL COMPLICATIONS ON THE LONG-TERM FUNCTIONAL OUTCOMES OF TRAUMA PATIENTS: A MULTICENTER STUDY.

Presenter: Jae Moo Lee, BA *Discussant*: David Efron, MD

10:18-10:30 am Break

Location: Seaport Foyer, Second Level (Seaport Tower)

Session XXVII: Quickshot I

14-26

Moderator:
Elliott Haut, MD, PhD

Location:
Seaport A-C, Second Level (Seaport Tower)

Quickshot 14 ***10:30-10:36 am***
ARE YOU KIDDING? PEDIATRIC TRAUMA CENTER VERIFICATION IMPROVES OUTCOMES AT AN ADULT CENTER
Presenter: Sean Maloney, MD *Discussant*: Daniel Margulies, MD

Quickshot 15 ***10:36-10:42 am***
TRAUMA OVER-TRIAGE, CONCURRENT TRAUMA ACTIVATION AND OVERLAPPING EGS SURGERY ARE NOT ASSOCIATED WITH SHORT OR LONG TERM MORTALITY IN EGS PATIENTS
Presenter: Ariel Knight, MD *Discussant*: Sasha Adams, MD

Quickshot 16 ***10:42-10:48 am***
BETA-ADRENERGIC BLOCKADE FOR TREATMENT OF TRAUMATIC BRAIN INJURY: A RANDOMIZED CONTROLLED TRIAL
Presenter: Thomas Schroeppel, MD, MS *Discussant*: Bryan Cotton, MD

Quickshot 17 ***10:48-10:54 am***
PHYSIOLOGIC IMPACT OF XSTAT 30 USE IN THE MANAGEMENT OF NON-COMPRESSIBLE TORSO HEMORRHAGE
Presenter: Alicia Bonanno, MD *Discussant*: Travis Polk, MD

Quickshot 18 ***10:54-11:00 am***
PERCENT CHANGE FROM PRE-INJURY BLOOD PRESSURE IS AN INDEPENDENT PREDICTOR OF MORTALITY IN ELDERLY TRAUMA
Presenter: Kelly Boyle, MD *Discussant*: Jennifer Hubbard, MD

Quickshot 19 ***11:00-11:06 am***
THE NLRP3 INFLAMMASOME PATHWAY LEADS TO THE LOSS OF BLOOD-BRAIN BARRIER INTEGRITY IN TRAUMATIC BRAIN INJURY
Presenter: Bobby Robinson, MD *Discussant*: Mayur Patel, MD, MPH

Quickshot 20 ***11:06-11:12 am***
OBESITY IS NOT ASSOCIATED WITH MICROVASCULAR INFLAMMATION FOLLOWING INJURY
Presenter: Robert Winfield, MD *Discussant*: Carlos Brown, MD

Quickshot 21 ***11:12-11:18 am***
THE DIVERSITY OF SURGICAL CRITICAL CARE: A REPORT OF THE TRAUMA ICU PREVALENCE PROJECT (TRIPP), AN AAST MULTI-INSTITUTIONAL STUDY
Presenter: Christopher Michetti, MD *Discussant*: Panna Codner, MD

Quickshot 22 ***11:18-11:24 am***
TEACHING HOW TO STOP THE BLEED: DOES IT WORK? A PROSPECTIVE EVALUATION OF TOURNIQUET APPLICATION IN SECURITY AND LAW ENFORCEMENT PERSONNEL
Presenter: Fahd Ali, MD *Discussant*: Babak Sarani, MD

Quickshot 23 ***11:24-11:30 am***
WHEN IS IT SAFE TO START VTE PROPHYLAXIS AFTER BLUNT SOLID ORGAN INJURY? A PROSPECTIVE STUDY FROM A LEVEL I TRAUMA CENTER
Presenter: Morgan Schellenberg, MD, MPH *Discussant*: Forrest Fernandez, MD

Quickshot 24 ***11:30-11:36 am***

THROMBOPROPHYLAXIS WITH NOVEL ORAL ANTICOAGULANTS IS ASSOCIATED WITH LOWER VENOUS THROMBOEMBOLIC EVENTS IN OPERATIVE SPINE TRAUMA

Presenter: Mohammad Hamidi, MD *Discussant*: Mark Cipolle, MD, PhD

Quickshot 25 ***11:36-11:42 am***

AMERICAN FIREARM HOMICIDES: THE IMPACT OF YOUR NEIGHBORS

Presenter: Erik Olson, MD *Discussant*: Omar Danner, MD

Quickshot 26 ***11:42-11:48 am***

IMPACT OF LICENSED FEDEvRAL FIREARM SUPPLIERS ON FIREARM-RELATED MORTALITY

Presenter: Stephanie Chao, MD *Discussant*: Sherry Sixta, MD

12:00-2:00 pm *TSACO* Editorial Board Meeting

Location: La Jolla, Second Level (Seaport Tower)

WTC SCHEDULE & ABSTRACTS

SAVE THE DATE!

WORLD TRAUMA CONGRESS

26TH - 29TH OCTOBER 2020

BRISBANE, AUSTRALIA

HOSTED BY AUSTRALASIAN TRAUMA SOCIETY (Inc)

For further information please contact:
The Australasian Trauma Society
ATS Secretariat
PO Box 576
Crows Nest NSW Australia 1585
P: Intnl +61 2 9431 8668
Local/National 02 9431 8668
E: wtc2020@theassociationspecialists.com.au

http://traumasociety.com.au

2020

77th Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery

4th World Trauma Congress

World Trauma Congress Schedule

September 26-29, 2018 • San Diego, CA

*Meeting room locations are subject to change. Please check the Annual Meeting App for the most up to date room assignments.

77th Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery

4th World Trauma Congress

World Trauma Congress Schedule

September 26-29, 2018 • San Diego, CA

Thursday 9/27

*Meeting room locations are subject to change. Please check the Annual Meeting App for the most up to date room assignments.

6:15-7:15 A.M.

6:15-7:15 am

Session VIII: WTC I Sessions

WTC 1: Resuscitation **Sponsored by Australasian Trauma Society**

Location: Coronado A, Fourth Level (Harbor Tower)

Moderators: John Cook-Jong Lee, MD, South Korea and Michael Parr, MD, Australia
Keynote: Michael Parr, MD, Management of Traumatic Cardiac Arrest

FEISTY - Fibrinogen Early In Severe Trauma studY: Fibrinogen Concentrate Vs. Cryoprecipitate In Severe Traumatic Haemorrhage: A Pilot Randomised Controlled Trial
Presenter: James Winearls, MD, BS, Australia

ORGAN FAILURES FOLLOWING RESUSCITATIVE ENDOVASCULAR OCCLUSION OF THE AORTA: A PROPENSITY SCORE MATCHING ANALYSIS
Presenter: Atsushi Shiraishi, MD, PhD, Japan

PREDICTING MORTALITY AFTER TRAUMATIC BRAIN INJURY: PROGNOSTIC MODEL BASED ON ADMISSION CHARACTERISTICS
Presenter: Jose D. Charry, MD, PhD, Colombia

ATLS® PROTOCOL ADHERENCE BY GENERAL SURGERY RESIDENTS IN THE EMERGENCY ROOM: A SIMULATION-BASED APPRAISAL
Presenter: Gustavo Fraga, MD, PhD, Brazil

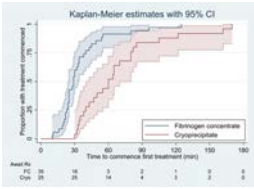
PENETRATING INJURY TO THE CARDIAC BOX
Presenter: Jennie SoMang Kim, MD, USA

Session VIII: WTC I Resuscitation
Paper 1: 6:15am - 7:15am

FEISTY - Fibrinogen Early In Severe Trauma Study: Fibrinogen Concentrate Vs. Cryoprecipitate In Severe Traumatic Haemorrhage: A Pilot Randomised Controlled Trial

James Winearls BS,MD, Martin Wullschleger MD,Ph.D., Elizabeth Wake BS,RN, Catherine Hurn MD, Anthony Holley MD, Glen Ryan MD, Jeremy Furyk MD, Gerben Keijzers MD,Ph.D., Wayne Dyer Ph.D., John Fraser MD,Ph.D., Jeff Presneill MD,Ph.D., Don Campbell MD, Gold Coast University Hospital

Introduction: Trauma is a leading cause of death worldwide and represents a global health concern. Major haemorrhage in the setting of severe trauma is associated with significant morbidity and mortality. Hypofibrinogenaemia plays a significant role in traumatic haemorrhage and is associated with worse outcomes. It is postulated that early fibrinogen replacement may reduce haemorrhage and improve outcomes. This study assessed the effects of a targeted dose of Fibrinogen Concentrate (FC) vs Cryoprecipitate (Cryo) in traumatic haemorrhage. It was hypothesised that fibrinogen replacement can be achieved quicker with a more predictable dose response using FC compared to Cryo.
Methods: A multi-centre, randomised controlled, un-blinded, feasibility pilot study. **Primary study aims:** 1) Investigate the feasibility of early targeted fibrinogen replacement in traumatic haemorrhage 2) Compare time to administration of fibrinogen replacement between FC and Cryo 3) Investigate feasibility of study protocol in a pilot multicentre study. **Inclusion Criteria:** 1) Adult affected by Trauma 2) Judged to have significant haemorrhage 3) Predicted to require significant transfusion with ABC score ≥ 2 or by treating clinician judgement. **Intervention:** 100 patients were randomised into FC (Intervention) or Cryo (Comparator) arms with requirement for fibrinogen replacement triggered by pre-specified ROTEM values – FIBTEM A5 ≤ 10 mm. **Primary outcome measures:** 1) Time to administration of Fibrinogen Replacement 2) Feasibility of administering FC within 30 mins 3) Effects on Fibrinogen levels during traumatic haemorrhage. **Secondary outcome measures:** 1) Transfusion requirements 2) Duration of bleeding episode 3) ICU and Hospital LOS 3) Thromobembolic events 4) Mortality.
Results: Full primary outcome data was available for 94 patients. FC Arm FIBTEM A5 (n=47): Median 8 mm (IQR 7 – 10) Cryo Arm (n=47): 10 mm (8 – 14). FC Arm 36/47 (77%) had a FIBTEM A5 ≤ 10 mm - median transfusion of 3g FC. Cryo Arm 26/47 (55%) had a FIBTEM A5 ≤ 10 mm - median transfusion of 8 Units Cryo. Time to administration was for **FC 29 min** (IQR 23 – 40) [Range 10 - 125] compared to **Cryo 60 min** (40 – 80) [30 - 170]. The mean time to first treatment advantage for FC over Cryo was **33 min** (95% CI 17 to 48 min). The HR for commencement of treatment was **2.8** (95% CI 1.7 to 4.9) in favour of FC relative to Cryoprecipitate. Full data analysis for remaining outcome measures will be available by June 2018.



Conclusions: FC therapy commenced a median of 31 minutes before Cryo. Assessed using a time to event method, patients in the FC arm were on average almost three times more likely to have commenced treatment compared to those in Cryo arm. These results suggest that FC may have a substantial advantage in time to administration relative to Cryo. There is currently insufficient evidence to support one means of fibrinogen replacement over another; resulting in non-uniform practices within facilities and diverse transfusion guidelines. This study will add to the evidence base and inform the planning of a definitive multi-centre study with patient centred outcomes as primary outcomes.

Session VIII: WTC I Session: Resuscitation
Paper 2: 6:15am - 7:15am

ORGAN FAILURES FOLLOWING RESUSCITATIVE ENDOVASCULAR OCCLUSION OF THE AORTA: A PROPENSITY SCORE MATCHING ANALYSIS

Atsushi Shiraishi MD,Ph.D., Yasuhiro Otomo MD,Ph.D., Junichi Inoue MD,Ph.D., Toshinao Suzuki MD, Kameda Medical Center

Introduction: Despite the growing importance of resuscitative endovascular balloon occlusion of the aorta (REBOA) in critically bleeding trauma patients, reports on benefits and drawbacks regarding mortality and organ failure following REBOA have been heterogeneous and inconclusive in previous studies. This study aimed to compare and assess not only mortality, but also organ failure, in critically bleeding trauma patients who did and did not undergo REBOA.

Method: From the Japan Trauma Databank, a retrospective, observational, nationwide, registry-based, and propensity score-matched cohort study included adult (≥16 years old) trauma patients who underwent torso emergency surgery. Patients whose systolic blood pressure was 0 mmHg at the baseline were excluded. After multiple imputation for all the study variables, propensity scores to predict the use of REBOA were generated from 54 covariates at the baseline as fixed-effect and hospital as random-effect by the logistic regression mixed effect model, and were used for 1:1 within-cluster (hospital) matching for patients who underwent REBOA with those who did not. The study outcomes included in-hospital mortality, organ failure including supra-diaphragmatic organ failure (brain, heart, and lung dysfunction), infra-diaphragmatic organ failure (abdominal organ dysfunction and pulmonary embolism following deep vein thrombosis), systemic organ failure (sepsis and coagulopathy), and a combination of in-hospital mortality and any kind of organ failure.

Results: Within-cluster propensity score-matching included 607 patients each who did and did not undergo REBOA. Baseline covariates were adequately matched (absolute standardized mean difference [ASMD] <0.1) between patients who did or did not undergo REBOA, including age (54 versus 53 years [median], respectively, ASMD 0.019), sex (68% male versus 68% male, respectively, ASMD 0.007), systolic blood pressure (84 versus 80 mmHg [median], respectively, ASMD 0.062), and the Injury Severity Score (34 versus 34 [median], respectively, ASMD 0.026). Undergoing REBOA was associated with higher in-hospital mortality (57% versus 37%, respectively, difference +20% [95% confidence interval (CI) +15%, +26%], P<0.001). Supra-diaphragmatic (13% versus 14%, difference -1% [95% CI -5%, +3%], P=0.737) and infra-diaphragmatic (2% versus 3%, difference -0% [95% CI -2%, +1%], P=0.712) organ failures did not differ in patients who did and did not undergo REBOA, respectively; however, excess prevalence in systemic organ failures was observed in association with REBOA (24% versus 18%, respectively, difference +6% [95% CI +1%,+11%], P=0.011). REBOA was also associated with the combined outcome including in-hospital death or any organ failure (68% versus 52%, respectively, difference +17%[95% CI +11%, +22%]).

Conclusion: In this retrospective, observational, propensity score-matched study, undergoing REBOA was associated with higher mortality, higher prevalence of systemic organ failures including coagulopathy and sepsis, and fewer organ failure-free survival.

Session VIII: WTC I Session: Resuscitation
Paper 3: 6:15am - 7:15am

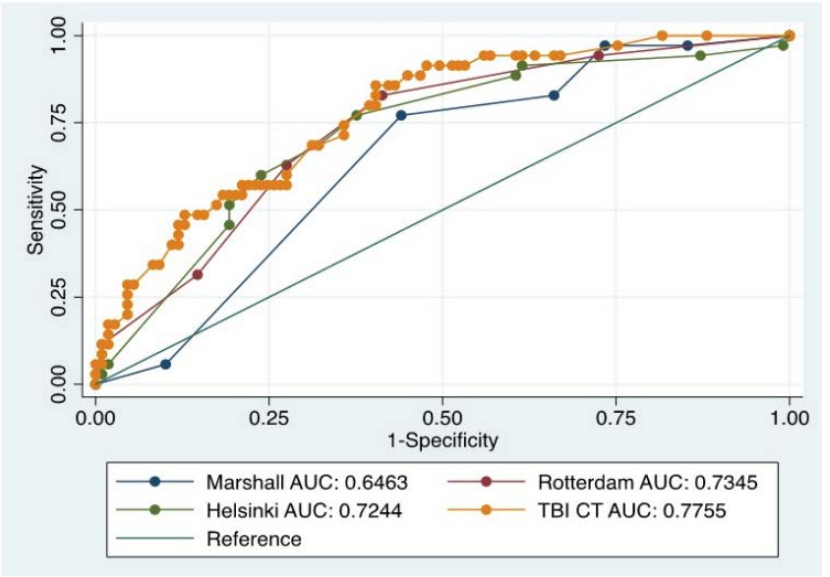
PREDICTING MORTALITY AFTER TRAUMATIC BRAIN INJURY: PROGNOSTIC MODEL BASED ON ADMISSION CHARACTERISTICS

Jose D. Charry MD,Ph.D., Juan P. Solano MD, Jorman H. Tejada MD, FUNDACIÓN UNIVERSITARIA NAVATTA

Introduction: Traumatic Brain Injury (TBI) is a public health problem. It is a pathology that causes significant mortality and disability. Different models have been developed in order to predict the neurological outcomes. Marshall computed tomographic (CT) classification is widely used as a predictor of outcome. However, this grading system lacks useful variables to predict the outcome of the patient, which are subarachnoid/intraventricular hemorrhage, extradural haematoma, and extent of basal cistern compression. We aimed to develop and validate a practical prognostic model that include all the variables above and predict death at six months after TBI.

Methods: Prospectively collected individual patient data were analyzed. The CT model included midline shift over 5 mm, normal, compressed or absent basal cisterns, subarachnoid bleeding, basal bleeding, intraventricular bleeding, contusion and epidural, subdural or intracerebral haematoma. We considered predictors available at admission in logistic regression models to predict mortality at 6 months after TBI. The performance and accuracy of several model was assessment using the Spearman's rank correlation coefficient and the area under the receiver operating characteristic curve (AUC).

Results: A total of 145 patients were recruited for study, median age 33 (15-85) years, and 86.89% were male. The overall mortality was 24.82%. The median GCS of patients was 6 (3-12). The Marshall CT classification discrimination was AUC= 0.646, Helsinki CT Score discrimination was AUC= 0.724, Rotterdam grading discrimination was AUC= 0.735, all these with a low correlation with the outcome (Spearman's rho <0.40). Our model showed the best performance and correlation with 6-month mortality: AUC= 0.7755, Spearman's rho 0,4201, p= 0.000.



Conclusion:Our prognostic mortality CT model showed a great performance and accuracy and can be used to obtain valid predictions of relevant outcomes in patients with TBI.

ATLS® PROTOCOL ADHERENCE BY GENERAL SURGERY RESIDENTS IN THE EMERGENCY ROOM: A SIMULATION-BASED APPRAISAL

Bruno M. Pereira MD,Ph.D., Cristiane P. Lopes MD, Juliany L. Silva Thiago R. Calderan MD, Bruno De Jorge Alcir E. Dorigatti MD, Jose B. Bortoto MD, Elcio S. Hirano MD,Ph.D., Gustavo P. Fraga MD,Ph.D., University of Campinas

Introduction: Decision-making process has been insufficiently discussed in medical teaching. Recently, more importance has being given to the study of critical decision-making capacity in simulation-based scenarios. This study aim to evaluate adherence to the Advanced Trauma Life Support (ATLS ®) protocol by general surgery residents when exposed to clinical simulation scenario as well as their ability to take critical life saving decisions in a stressfull scenario.

Methods: 44 general surgery residents from a unique university teaching hospital were exposed to 23 identical trauma simulation scenarios between 2013 – 2016. A score has been given according to Resident's performance and adherence to ATLS® protocol. All simulation case scenarios were also recorded and reviewed by a different evaluator of the live case-scenario. Performance scores were confronted and discussed all together in order to lower any possible bias. Here, this group of authors studied the adherence of 44 residents to the ATLS® protocol as well as their decision-making capacity in a critical scenario.

Results: Unconformities factors were identified on general surgery residents adherence to the ATLS® protocol. Lack of attention, failure to comply with rapid sequence intubation protocol with adequate pre-oxygenation, conceptual lapse in volume ressucitation and neglection of hypothermia prevention were the most important observed points. There were also identified failures in the process of critical decision-making.

Conclusion: Current protocols despite of objectifying a clear and logical method of attending trauma victims at the emergency room, are unable to exclude personal decision-making process. Focus by tutors and teachers should be given to physicians in training for general surgery in the pre-oxygenation, measures of confirmation of the process of intubation in the emergency room, massive transfusion protocol and hypothermia prevention.

Session VIII: WTC I Session: Resuscitation
Paper 5: 6:15am - 7:15am

PENETRATING INJURY TO THE CARDIAC BOX

Jennie S. Kim MD, Kenji Inaba* MD, FRCSC, FACS, Luis Alejandro De Leon MD, Cyrus Rais BA, John B. Holcomb* MD, FACS, Jean Stephane David MD, Demetrios Demetriades* MD,Ph.D., FACS LAC+USC Medical Center

Introduction: Classically, a penetrating injury to the "cardiac box" has been thought to be predictive of an injury to the heart, however, there is very little evidence available to support this association. This study aims to further evaluate the relationship between penetrating trauma to the cardiac box and a clinically significant injury.
Methods: All patients 18 years and older presenting to a Level 1 trauma center from 01/2009 – 06/2015 who sustained a penetrating injury isolated to the thorax were retrospectively identified. Patients were categorized according to the location of their injury: within or outside the historical cardiac box defined by the sternal notch superiorly, the xiphoid process inferiorly, and the nipples laterally. Patients with concurrent injuries both inside and outside the cardiac box were excluded. Clinical demographics, injuries, procedures, and outcomes were compared.
Results: During this 7-year period, 330 patients (92% male; median age, 28 years) sustained penetrating injuries isolated to the thorax: 138 patients (42%) within the cardiac box and 192 patients (58%) outside the cardiac box. By mechanism, 105 (76%) were stab wounds (SW) and 33 (24%) were gunshot wounds (GSW) inside the cardiac box, and 125 (65%) SW and 67 (35%) GSW outside the cardiac box. The overall rate of thoracotomy or sternotomy was significantly higher in patients with penetrating trauma within the cardiac box [35/138 (25.4%) vs. 15/192 (7.8%), $p<0.001$]. These patients also had a higher incidence of cardiac injury compared to patients with wounds outside the box [18/138 (13%) vs. 5/192 (5%), $p<0.001$]. There was no difference in overall mortality [9/138 (6.5%) vs. 6/192 (3.1%), $p=0.144$]. On multivariate logistic regression, a penetrating injury within the cardiac box was an independent risk factor for undergoing a thoracotomy or sternotomy (adj $p=0.008$, OR 3.255, 95% CI 1.353-7.832) and for cardiac injury (adj $p=0.008$, OR 6.845, 95% CI 1.636-28.636).
Conclusion: Penetrating trauma within the cardiac box is associated with a higher risk of cardiac injury and need for thoracotomy or sternotomy than injuries outside the cardiac box. Injuries outside the cardiac box still warrant rapid assessment as they have a one in twenty chance of an associated cardiac injury.

WTC 2: Quality **Sponsored by the Eastern Association for the Surgery of Trauma**

Location: Seaport A-C, Second Level (Seaport Tower)

Moderators: Michel Aboutanos, MD and Bruce Crookes, MD USA
Keynote: Bruce Crookes, MD, Quality in Trauma: Navigating the Perfect Storm

LOW VALUE SURGICAL PRACTICES IN TRAUMA CARE: A SCOPING REVIEW AND EXPERT CONSULTATION STUDY
Presenter: Lynne Moore, PhD, Canada

EFFECTS OF THE FULLY ENFORCED AFFORDABLE CARE ACT
Presenter: Krista Haines, DO, USA

PREDICTION MODELS FOR HEALTH STATUS 6-MONTHS AND 1-YEAR AFTER INJURY: A PROSPECTIVE COHORT STUDY
Presenter: Leonie De Munter, MSc, Netherlands

CAUSES OF PREVENTABLE AND POTENTIALLY PREVENTABLE DEATH IN TRAUMA PATIENTS IN A COMPREHENSIVE TRAUMA CENTER IN CHINA
Presenter: Zhanfei Li, MD, PhD, China

TRAUMA TERTIARY SURVEY: IMPROVING COMPLIANCE IN FOUR STEPS
Presenter: Juan Herrera-Escobar, MD, USA

Session VIII: WTC I Session: Quality
Paper 1: 6:15am - 7:15am

LOW VALUE SURGICAL PRACTICES IN TRAUMA CARE: A SCOPING REVIEW AND EXPERT CONSULTATION STUDY

Lynne Moore Ph.D., Khadidja M. Boukar PhD candidate, Howard Champion MD, Pier-Alexandre Tardif MSc, Natalie Yanchar MD,MPH, John Kortbeek MD, Julien Clément MD, David Evans MD, Morad Hameed MD,MPH, Radoslav Krouchev MD,MPH, Laval University

Introduction: Injuries lead to 200,000 hospital stays, 60,000 disabilities, and 13,000 deaths per year in Canada with direct costs of $16 billion. Low-value medical interventions are estimated to consume up to 30% of healthcare resources and may expose patients to avoidable harm. However, little is known about healthcare overuse in trauma populations. We aimed to identify low-value clinical practices in trauma surgery.
Methods: We conducted a scoping review of peer- and non-peer-reviewed literature followed by a consultation with experts. We identified research articles, reviews, recommendations and guidelines that identified at least one low-value clinical practice specific to hospitalized injury populations. We searched Medline, Embase, Cochrane CENTRAL, and Web of Science databases, websites of government agencies, professional societies and patient advocacy organizations, thesis holdings and conference proceedings. Pairs of independent reviewers evaluated studies for eligibility and extracted data from included articles using a pre-piloted and standardized electronic data abstraction form. We documented the level of evidence by the number and type of studies reporting on each clinical practice. We then consulted experts in two phases: to classify, group and standardize identified surgical practices and to rate them according to their potential to be low-value.
Results: The systematic scoping review revealed 72,226 citations of which 1,486 were deemed eligible and led to the identification of 113 surgical practices. Following the first phase of consultation, 24 surgical practices were retained. Of these, 11 were considered clearly or potentially low value by experts (see Table 1 for examples).
Conclusion: This review contributes new knowledge on low-value surgical practices in acute injury care. This is the first study of the *Canadian Program for Monitoring Low Value Clinical Practices in Injury Care*, funded by the *Canadian Institutes of Health Research* and conducted in collaboration with *Choosing Wisely*. In addition to surgical care, the program targets injury care in the emergency department, the intensive care unit, and orthopedics. This review represents a first step towards developing valid and reliable metrics to monitor potentially unnecessary or harmful practices in acute injury care. These metrics will provide a solid basis for the development of interventions targeting de-adoption such as shared decision-making tools. Such interventions have the potential to reduce costs, delays and unnecessary hospital days and increase resource availability. They may also improve patient outcomes through a reduction in exposure to adverse events.

Surgical practice	RCTs & meta-analyses of RCTs	Meta-analyses observational studies	Observational studies	Other*
Stent graft for minimal aortic injury with regression on follow-up CTA				1
Surgical management in penetrating neck injury with soft signs on clinical exam and negative CTA			8	3
Surgical management in blunt, stable isolated splenic injury		1	2	3
Damage control laparotomy in physiologically restored trauma patients without massive transfusion	2	1	32	21

CTA: Computed tomography angiography, RCT: Randomized controlled trial
* Case reports, case series, cross-sectional studies, expert opinion/letter to the editor, narrative reviews

Session VIII: WTC I Session: Quality
Paper 2: 6:15am - 7:15am

Effects of the Fully Enforced Affordable Care Act

Krista Haines DO, Suresh Agarwal MD, Duke University

Introduction: The Affordable Care Act (ACA) of 2010 was created to expand insurance coverage for all Americans. This analysis was done to determine if the ACA, once it was fully enforced, expanded coverage and improved outcomes for trauma patients.

Methods: Trauma patient's ages 15-65 years who presented between 2007 and 2015 were identified in the National Trauma Data Bank (NTDB). Those patients with unknown disposition where excluded from analysis as well as patients who would have qualified for social security secondary to age. Patients were grouped by years: 2007-2009 pre-ACA, 2011-2013 post-ACA, and 2014-2015, once the ACA was fully enforced. Patient outcomes of interest included hospital length of stay (LOS), in-hospital mortality, and discharge disposition. Multivariate regression models for mortality and LOS were built controlling for injury severity (ISS), age, gender, race, patient comorbidities, and insurance status to determine if these grouped years affected outcomes.

Results: There were 10,830,716 patients included in this analysis. Patients were 40 ±15 years old and 72% were male. Mean ISS was 9.9±9 and LOS was 6.0±9 days. Prior to the ACA patients were significantly more likely to die controlling for all above covariates ($p<0.001$, CI 0.0018-0.0023). Patients from 2011-2013 were less likely to die, while patients who presented from 2014-2015 once the act was fully enforced had the lowest mortality of all groups ($p<0.001$). In the same regression model, patients with insurance other than private and minorities were more likely to die as compared to their Caucasian privately insured counterparts ($p<0.0001$). Regression for LOS controlling for same covariates including comorbidities found patients from 2014-2015, despite having better outcomes, had the lowest LOS ($p<0.001$). Furthermore, patients from 2011-2013 had a significantly shorter hospital LOS than those patients prior to the enactment of ACA ($p<0.001$). Uninsured patients, excluding AMA, had significantly lower LOS than all other patients controlling for all years ($p<0.001$).

Conclusion: This analysis demonstrates that once the ACA was fully enforced, the group of Americans trauma patients with the highest rate of uninsured patients had better outcomes. Not only did their outcomes improve immediately following implementation of the ACA from 2011 to 2013, but improved significantly more once the act was entirely engrained within the US healthcare system.

Session VIII: WTC I Session: Quality
Paper 3: 6:15am - 7:15am

PREDICTION MODELS FOR HEALTH STATUS 6-MONTHS AND 1-YEAR AFTER INJURY: A PROSPECTIVE COHORT STUDY

Leonie De Munter MSc, Suzanne Polinder Ph.D., Nena Kruithof MSc, Cornelis L. Van De Ree MD, Ewout W. Steyerberg Ph.D., Mariska A. De Jongh Ph.D., Elisabeth-Twee Steden Hospital

Introduction: Trauma patients often perceive an impaired health related quality of life after trauma. This study aims to develop a prediction model for health status in the general trauma population, based on 6-months and 12-months outcome. The model should incorporate easily accessible predictors.

Methods: A total of 9774 adult trauma patients were included from August 2015 through November 2016 if they were admitted to one of the ten hospitals in the county. Outcome measures were the EuroQol-5 dimensions (EQ-5D) and the Health Utilities Index (HUI) 6 months and 1 year after trauma. Summary scores were calculated for all outcome measures. Possible predictors were pre-injury health status, injury severity, patient characteristics and frailty pre-injury (measured with the Groningen Frailty Index). All potential predictors were assessed with univariable linear regression. Predictors were included in the multivariable model if $p<0,2$. The model performances were assessed with Nagelkerke R-square (R^2).

Results:**.** A total of 2,106 patients and 1,938 patients were used to develop a prediction model for functional outcome, respectively 6 months and 1 year after injury. Pre-injury health status and frailty pre-injury were the strongest predictors for functional outcome in the general trauma population. Age, comorbidity, social economic status, functional capacity index, injury severity score, length of stay in hospital were also included in the multivariable prediction models. The model explained 50% of the variance for EQ5D-utility score ($R^2=0.5$) and 40% of the variance was explained for HUI 2 or HUI 3 index scores ($R^2=0.4$).

Conclusion:To our knowledge, these are the first models to predict health status 6 months and 1 year after trauma. The models seem promising for predicting health status of trauma patients in the western society. However, future research is recommended to externally validate the models.

Session VIII: WTC I Session: Quality
Paper 4: 6:15am - 7:15am

Causes of preventable and potentially preventable death in trauma patients in a comprehensive trauma center in China

Zhanfei Li MD,Ph.D., Xi-er Xu BS, Xiangjun Bai MD,Ph.D., Tongji Hospital

Introduction:Trauma and accidental death account for the five common causes of mortality in China as well as worldwide. Introduction of trauma centers improves severely injured patients care. Since the trauma centers are established in China, there are advances in trauma care management. In this retrospective study, we analyzed the causes of preventable and potentially preventable early in-hospital death in a comprehensive trauma center in China. the purpose of this study was to analyze the deficits in medical care for injured patients, and to provide clue of how to improve the trauma care system in the future.

Methods: The clinical data of early in-hospital mortality from 2000 to 2014 in the Trauma Center of Tongji Hospital were collected**.** The demographic data, causes and mechanisms of injury, anatomy of injury, as well as pre-hospital care of these patients were assessed. The medical deficits were also studied. The data were acquired from medical records. The classification of inevitable or potentially avoidable death was determined on the basis of available data, mainly by clinical consideration. We analyzed data by GraphPad Prism 5, $P<0.05$ was set statistically significant.

Results: Seventy-four percent of our patients were males and the median of age was 42. Traffic injury was the leading cause of trauma death in 49%. The site of injury was cranio-cerebral in 72% of our patients. From 2010 to 2014 the number of deaths increased with a rate of 33%. In all groups, the number of deaths was increased in less than one hour from the time of injury in 54% ($P<0.05$). Most of deaths were inevitable in all groups in 79% ($P<0.05$). Among deaths considered as potentially avoidable or avoidable, a total of 182 deficits are noticed. The inappropriate transfer is the leading deficit encountered. Other deficits are: inadequate resuscitation, inappropriate airway management, inadequate bleeding control and missed diagnosis.

Conclusion:Inappropriate transfer, inadequate fluid resuscitation, airway management and bleeding control, and missed diagnosis are major deficits of medical care for severely injured patients. More training for trauma management and better patient-doctor relationship will help to improve the outcome of severely injured patients.

Session VIII: WTC I Session: Quality
Paper 5: 6:15am - 7:15am

Trauma Tertiary Survey: Improving Compliance in Four Steps

Juan P. Herrera-Escobar MD, Arturo J. Rios-Diaz MD, Amy Bulger MPH,RN, Meghan McDonald RN, Samir Shah BS, Barbara U. Okafor BS, Katherine Armstrong MPH, Ramsis Ramsis BS, Edward J. Caterson MD,Ph.D., Ali Salim MD, Deepika Nehra MD, Brigham and Womens Hospital

Introduction: Missed injury rate is a commonly used quality indicator of trauma care performance. The routine completion of trauma tertiary surveys (TTS) has been recommended to minimize the rate of missed injuries amongst hospitalized trauma patients. However, poor compliance in the routine documentation of TTS is commonly reported. In this study, we sought to determine whether the implementation of a standardized TTS template increases the compliance of TTS completion and documentation.

Methods: The current project was developed in four steps: 1) development of a standardized TTS template in collaboration with multiple stakeholders at a Level I Trauma Center; 2) education campaign and dissemination of TTS documentation guidelines; 3) project launch in March 2016; and 4) data collection and analysis. For the last phase, we retrospectively reviewed the medical charts of all patients admitted under the care of the trauma surgery service over the 6 month period from September 2015-February 2016 (pre-implementation group) and from September 2016-February 2017 (post-implementation group). Compliance and timeliness of completion of TTS in the charts was compared for the pre- and post-implementation groups.

Results: A total of 918 records were reviewed: 495 pre- and 423 post-implementation of a standardized TTS template. Patients in the pre-implementation group were more likely to be male and have longer length of stay compared to patients in the post-implementation group ($p<0.05$). Other demographics, clinical, and injury-related characteristics of patients were comparable between pre- and post-implementation groups ($p>0.05$). Compliance in documenting TTS in the medical charts was 58% before and 79% after implementation of the template ($p<0.001$). Furthermore, 96% of TTS were documented within the first 48 hours of admission in the post-implementation group, compared to 85% in the pre-implementation group ($p<0.001$). After implementing the template, the TTS template was used to document TTS in 85% of patients with a completed TTS.

Conclusion: The introduction of a standardized TTS template significantly improved compliance and timeliness in TTS documentation in medical charts. A standardized template for TTS completion and documentation and the regular education of health care providers on TTS guidelines may improve compliance with TTS documentation.

WTC 3: Innovative Care **Sponsored by Japanese Association for the Surgery of Trauma (JAST)**

Location: Hillcrest, Third Level (Seaport Tower)

Moderators: Hayato Kurihara, MD and Takahiro Kinoshita, MD, Japan
Keynote: Takahiro Kinoshita, MD, Hybrid ER

PROPENSITY-SCORE MATCHED ANALYSIS OF ENDOVASCULAR VS. OPEN REPAIR OF ISOLATED SUPERFICIAL FEMORAL AND POPLITEAL ARTERY INJURIES
Presenter: Daniel Alfson, MD, USA

THE EFFICACY OF A NOVEL TWO-ROOM TYPE ALL-IN-ONE TRAUMA RESUSCITATION SUITE: THE RETROSPECTIVE EVALUATION OF THE BENEFITS OF TIME-SAVING AND COST-EFFECTIVENESS.
Presenter: Taku Kazamaki, MD, Japan

RESUSCITATIVE ENDOVASCULAR OCCLUSION OF THE AORTA 'REBOA': INDICATIONS-ADVANTAGES AND CHALLENGES OF IMPLEMENTATION IN TRAUMATIC NON-COMPRESSIBLE TORSO HEMORRHAGE - A SCOPING REVIEW
Presenter: Omar Bekdache, MD, Canada

THE ROLE AND AVAILABILITY OF TEVAR WITH DEBRANCHING TECHUNIQUE FOR BLUNT TRAUMATIC AORTIC INJURY IN THE SEVERE MULTIPLE TRAUMA PATIENTS.
Presenter: Kenichiro Uchida, MD, PhD, Japan

ENDOVASCULAR MANAGEMENT IN TRAUMATIZED PATIENTS: EXPERIENCE AT A LEVEL 1 TRAUMA CENTER IN AN UPPER-MIDDLE INCOME COUNTRY.
Presenter: Ana Del Valle, MD, Colombia

Session VIII: WTC I Session: Innovative Care
Paper 1: 6:15am - 7:15am

Propensity-score matched analysis of endovascular vs. open repair of isolated superficial femoral and popliteal artery injuries

Daniel B. Alfson MD, Vincent L. Rowe MD, Niquelle B. Wade MS, Kenji Inaba MD, Gregory A. Magee MD, MSc University Of Southern California

Introduction: Endovascular therapy of traumatic vascular injuries has increased dramatically during the past decade. No large studies have reported the outcomes for endovascular versus open repair of isolated superficial femoral (SFA) and popliteal artery (PA) injuries.

Methods: Analysis of the National Trauma Data Bank (NTDB: 2007-2014) was performed to identify all patients with a superficial femoral or popliteal artery injury. Isolated SFA and PA injuries were defined as cases with abbreviated injury scale (AIS) severity score <4 for non-lower extremity injuries. Nearest neighbor propensity score matching was used to account for pre-surgery differences in patients' demographic and clinical characteristics. Variables were selected for matching based on evidence of association with the exposure (repair type) and at least one patient outcome. Logistic regression models were used to assess associations between repair type and patient outcomes.

Results: A total of 11,395 patients with SFA or PA injuries were identified, of which 2,873 were defined as isolated SFA/PA injuries (163 endovascular repair and 2,710 open repair) and were included in the full analysis dataset. A propensity-matched dataset was derived from the full dataset using pre-treatment characteristics (gender, age, systolic blood pressure, pulse, ISS, SFA injury, PA injury, femur fracture/knee dislocation) and a 1:4 matching ratio (157 endovascular, 628 open). In the full analysis dataset, the percentage of patients who underwent endovascular repair increased from 3.2% in 2007 to 7.6% in 2014. Patients with isolated SFA/PA injuries had morbidity rates of: deep venous thrombosis (DVT) (endo 7.4%, open 4.2%, p=0.06), fasciotomy (endo 12.3%, open 49.7%, p<0.001), amputation (endo 4.3%, open 9.5%, p=0.025), acute kidney injury (AKI) (endo 3.1%, open 2.1%, p=0.403). In the propensity-matched dataset, endovascular repair was not associated with improved amputation-free survival (OR 1.16, 95% CI [0.60-2.10], p=0.65). However, there was a higher mortality (OR 3.69, p=0.008) and decreased fasciotomy risk (OR 0.23, p<0.001) among endovascular repair patients compared to open repair patients.

Conclusion: In patients with isolated SFA/PA injuries, endovascular repair was not associated with improved amputation-free survival. Mortality was higher in the endovascular repair group and the rate of fasciotomy was higher in the open group.

Table 1: Associations between Repair Type and Patient Outcomes in Propensity Matched Dataset

		Number of Patients with Outcome	OR	[95% CI]	p-value
Amputation-free survival	*Open repair*	579 (92%)	ref	--	
	Endovascular repair	143 (91%)	0.86	[0.48, 1.67]	0.65
In-hospital mortality	*Open repair*	9 (1%)	ref	--	
	Endovascular repair	8 (5%)	**3.69**	**[1.37, 9.82]**	**0.01**
Lower extremity amputation	*Open repair*	43 (7%)	ref	--	
	Endovascular repair	7 (4%)	0.63	[0.26, 1.35]	0.28
Fasciotomy	*Open repair*	242 (39%)	ref	--	
	Endovascular repair	20 (13%)	**0.23**	**[0.14, 0.37]**	**<0.001**

Odds ratios and 95% confidence intervals were calculated using a 1:4 propensity matched dataset using nearest neighbor matching. Propensity scores were calculated using gender, age, systolic blood pressure, pulse, ISS, SFA injury, PA injury, femur fracture/knee dislocation.

Session VIII: WTC I Session: Innovative Care
Paper 2: 6:15am - 7:15am

THE EFFICACY OF A NOVEL TWO-ROOM TYPE ALL-IN-ONE TRAUMA RESUSCITATION SUITE: THE RETROSPECTIVE EVALUATION OF THE BENEFITS OF TIME-SAVING AND COST-EFFECTIVENESS.

Taku Kazamaki MD, Nao Hiroe MD, Shokei Matsumoto* MD, Masayuki Shimizu MD, Tomohiko Orita MD, Tomohiro Funabiki MD,Ph.D., Motoyasu Yamazaki MD,Ph.D., Mitsuhide Kitano MD,Ph.D., Saiseikai Yokohamashi Tobu Hospital

Invited Discussant:

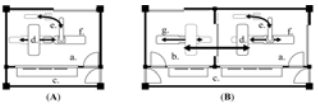


Fig 1. Comparison of (**A**) one-room type and (**B**) two-room type Hybrid ER. Legend: a. resuscitation room; b. examination room; c. control room; d. gantry; e. C-arm; f. operation table; g. examination bed.

Introduction: Recently, an all-in-one trauma resuscitation unit, comprised of computed tomography (CT) scanner, intervention radiology (IVR) system, and operation room (OR), known as a "Hybrid emergency room (ER)" was developed and the survival benefit of using that type of facility in severe trauma has been shown. This is assumed to reflect the shortened times to CT scan, subsequent diagnosis and decision making, and definitive therapies. From an economic aspect, however, the Hybrid ER could be too resource-intensive for many trauma patients. In October 2017, we installed a novel "two-room type" Hybrid ER in our shock trauma center. This facility combines a resuscitation room with an OR/IVR system and a standard CT examination room. The gantry of the CT is shared by both rooms, so the facility can be used as a standard CT room for scheduled examinations when the resuscitation room is not in use. We hypothesized that this type of hybrid ER could be as effective for trauma resuscitation as the conventional, one-room type Hybrid ER and resolve the concern about cost recovery.
Methods: This was a single center, retrospective, historically controlled observational study. (**A**) To evaluate the benefit of time-saving, we selected consecutive trauma patients with an Injury Severity Score (ISS) ≥16 who were admitted at a tertiary care hospital before and after the installation of the Hybrid ER. Patients who were dead on arrival or needed immediate ER thoracotomy were excluded. The time to CT scan was calculated for each case. (**B**) We evaluated costs for all patients, both trauma and non-trauma, who used the Hybrid ER for resuscitation after its installation. The stay time in the resuscitation room was also recorded, and the occupancy rate of the resuscitation room was calculated. The number of scheduled CT examinations performed within the Hybrid ER was also counted and the profit from them was estimated.
Results: (**A**) 106 patients were included in the study population. 50 patients were admitted before the Hybrid ER was installed, whereas 36 and 20 patients were admitted into the Hybrid ER or a conventional trauma bay after the installation, respectively. By using the Hybrid ER, the mean time to CT scanning was significantly decreased from 24.8 ±1.1 [min] to 10.4 ±0.8 [min] (mean ±standard error, p <0.0001). (**B**) Including non-trauma cases, there were 193 patients who used the Hybrid ER for their resuscitation. Their mean stay time in the resuscitation room was 74.4 ±5.7 [min] and the average number of cases per day was 1.6, therefore the total room occupancy rate was 8.1% of the day. While not in use for resuscitation, an average of 14.1 scheduled CT scans were done within the facility earning at least an estimated $1,355 per day.
Conclusion: The time to CT scan was significantly shortened in the Hybrid ER. This result is similar to that of a previous study, and the shortened time is expected to contribute to better survival. Meanwhile, the occupancy rate of the resuscitation room was less than one-tenth. Low operation rates might be a common characteristic of Hybrid ERs, leaving the potential for improved efficacy in its operation. The two-room type Hybrid ER would be one possible solution to the problem, contributing to the hospital's profits by enabling scheduled CT examinations.

Session VIII: WTC I Session: Innovative Care
Paper 3: 6:15am - 7:15am

RESUSCITATIVE ENDOVASCULAR OCCLUSION OF THE AORTA 'REBOA': INDICATIONS-ADVANTAGES AND CHALLENGES OF IMPLEMENTATION IN TRAUMATIC NON-COMPRESSIBLE TORSO HEMORRHAGE - A SCOPING REVIEW

Omar Bekdache MD, Tiffany Paradis Yu B. He Shen Aly Elbahrawy MD, Mohammed Alamoudi MD, Tarek Razek MD, Andrew Beckett MD, McGill University

Introduction: Resuscitative Endovascular Balloon Occlusion of the Aorta'REBOA' is recently gaining popularity in the treatment of traumatic non-compressible torso bleeding. Refinement of the technique supported by advances gained from the invasive radiology experience, endovascular treatment of AAA, added to other damage control measures nonavailable previously, helped in bringing back the technique with very promising outcomes. The literature is still having substantial heterogeneity about the clear indications of the procedure, the population that will benefit the most from its use, and the challenges faced while implementing the technique in a level I trauma center. Scoping reviews are excellent platforms to assess the diverse literature of a new technique. It is for the first time that a Scoping review is adopted for this topic.

Methods: Critical search from MEDLINE, EMBASE, BIOSIS, COCHRANE CENTRAL, PUBMED and SCOPUS was conducted from the earliest available dates till January 15,2018. Evidence-based papers as well as grey literature at large were analyzed regardless of the quality of manuscripts.

Results: Identification of 1176 articles related to the topic. Retrieval of 128 full papers for assessment. Quantitative and Qualitative measures included Demographics, Study design, Study Objectives, Methods of data collection, Indications, REBOA protocol used, time to deployment, Zone of deployment, Occlusion time, Complications, amount of blood used, Outcome, and level of expertise at the concerned Trauma Centers.

Conclusion: Growing levels of evidence are supporting the use of REBOA in selected indications. Analysis showed advantage for its use in terms of morbidities and physiologic derangement as compared to other methods. Challenges in implementation, competency assessment and credentialing are areas to be addressed. Recommended systematic reviews to identify proper indications, terms of use and possible advantage of pre-hospital and partial REBOA are topics for further researches.

Session VIII: WTC I Session: Innovative Care
Paper 4: 6:15am - 7:15am

THE ROLE AND AVAILABILITY OF TEVAR WITH DEBRANCHING TECHUNIQUE FOR BLUNT TRAUMATIC AORTIC INJURY IN THE SEVERE MULTIPLE TRAUMA PATIENTS.

KENICHIRO UCHIDA MD,Ph.D., YASUMITSU MIZOBATA MD,Ph.D., HIROMASA YAMAMOTO MD,Ph.D., TETSURO NISHIMURA MD,Ph.D., Osaka City University Graduate School Of Medicine

Introduction: The multiple trauma patients concomitant with blunt traumatic aortic injury (BTAI) tend to be severe and have high mortality and morbidity. The evaluation and treatment for BTAI needs accurate and immediate cooperation with many departments as trauma, radiology, and also cardiovascular surgery. We strive to perform thoracic endovascular aortic repair (TEVAR) ± debranching technique for thoracic BTAI and retrospectively reviewed the roles and short-term results of emergent TEVAR for BTAI.

Methods: The records of the BTAI patients were retrospectively reviewed for the vital signs on arrival, mechanism of injury, characteristics, time flow, concomitant injuries, injury description, operation procedures, and the outcomes. The patients arrived under cardiopulmonary arrest were excluded. All statistical data are described as median (25-75% interquartile range [IQR]) or number.

Results: From January 2015 to February 2018, 15 patients administrated as BTAI and 7 patients were treated by TEVAR. The median age was 44 (28-57) years old and 57.1 % was male. The grade of injury was all 3 or 4 and the time from admission to operation was 171 (127-216) minutes. One patient was hemodynamically unstable on arrival. The ISS was 34 (29-34) and Ps was 0.82 (0.16-0.94). Three were performed simple TEVAR (LSCA occlusion:1) and four were performed debranching TEVAR (LSCA occlusion + LCCA-LSCA bypass) because of detected anomary of vertebral artery. Two were performed under unheparinization. The concomitant injuries were one intracranial hemorrhage, three intra-abdominal injuries, three pneumo or hemothoraxes and six pelvic / extremities fractures. The other emergent interventions which performed concurrently or within 24 h after TEVAR were two transcatheter arterial embolizations, one external fixation of pelvis and three indirect tractions for fractures of extremities. There was no intraoperative complication or delay for interventions for other injuries and hospital death.

Conclusion: The short-term results of TEVAR with debranching technique for BTAI in multiple trauma patients were acceptable and no complications or delay of intervention for other injuries in the multiple trauma patients.

Session VIII: WTC I Session: Innovative Care
Paper 5: 6:15am - 7:15am

Endovascular management in traumatized patients: Experience at a Level 1 Trauma Center in an Upper-Middle Income Country.

Ana M. Del Valle MD, Hernan E. Munevar MD, Alberto F. Garcia MD, MSC, Ricardo Ferrada MD, FACS, Constanza Navarro MD, Juan C. Herrera MD, Juan P. Herrera MD, Juan C. Puyana MD, Juan P. Carbonell MD, Fundación Valle Del Lili

Introduction: Endovascular and hybrid therapy is a new treatment for complex trauma. We describe a case series of trauma patients with endovascular management at a Level I Trauma Center in an upper-middle income country.

Methods: Retrospective study of patients who received endovascular therapy from 2010 to 2017. Patients were divided in two groups (With single endovascular therapy (SET) and those with hybrid therapy (HT: endovascular and surgery management). Demographic data, injury details and treatment were registered.

Results: Were included 74 patients. 21 patients with SET and 44 with HT. In SET group, median age was 35 (IQR 22-56), ISS 16. The mechanism of trauma by gunshot was 53.3%. 26.7% arrived in shock. 43.3% the vascular trauma was subclavia artery. 46.7% were managed with covered stent. There were no deaths. HT group median age was 25 (IQR 20-42), ISS 25. 51.4% of trauma mechanism was penetrating by gunshot. 34 patients arrived in shock. In 84.1% the surgery was prior to endovascular procedure. In 50% were due to vascular trauma in areas of complex surgical approach (25% subclavian, 18% hypogastric and 10.8% hepatic arteries).5 patients with non-compressible torso hemorrhage needed REBOA. 47.7% presented active hemorrhage at angiography. 39.2% underwent Coil embolization. There were 6 deaths, none attributable to endovascular management.

	Endovascular Management N=30 n (%)	**Hybrid Management N= 44 n (%)**	**P value**
Shock (SBP<90 mm Hg)	8 (26.7%)	26 (59.1%)	0.006
Trauma mechanism			
Penetrating	19 (63.3%)	25 (56.8%)	NS
Blunt	11 (36.7%)	19 (43.2%)	NS
ISS*	16 (9 – 25)	30 (22- 43)	p<0.001
RTS*	7.8(7.1-7.8)	7(5.7-7.8)	0.005
Multiple Trauma	17 (56.7%)	34(77.3%)	NS
Complications	3 (10%)	19 (43.2%)	P<0.001
Endovascular complications	2 (6.7%)	4 (9.1%)	NS
ICU stay*	3 (1-6)	9 (6-16)	P<0.001
Hospital stay*	6 (3-10)	15 (9 – 20)	P<0.001
Mortality	0	6 (100%)	0.004

*Median (interquartile-range), ISS: injury severity score, RTS: revised score trauma, SBP: systolic blood pressure, ICU: Intensive care unit.

Conclusion: Endovascular and hybrid trauma management are still evolving. They seem to be a safe option and may be able to reduce mortality in penetrating trauma.

WTC 4: Critical Care **Sponsored by PanAmerican Trauma Society**

Location: Harbor C, Second Level (Harbor Tower)

Moderator: Ajai Malhotra, MD and Akio Kimura, MD, USA and Japan
Keynote: Thomas Scalea, MD, Acute Resuscitation Unit: Added Value Over ICU?

CLINICAL, LABORATORY AND VENTILATORY PREDICTORS FOR INTRA-ABDOMINAL HYPERTENSION IN SEPTIC SHOCK ICU PATIENTS
Presnter: Vitor Favali Krugar, MD, Brazil

EXTERNAL VALIDATION OF THE HELSINKI COMPUTED TOMOGRAPHY SCORE IN THE PREDICTION OF MORTALITY IN SEVERE TRAUMATIC BRAIN INJURY
Presenter: Jose Charry, MD, PhD, Colombia

OPTIMIZING CRITICAL CARE OF THE TRAUMA PATIENT IN A COST-EFFICIENT WAY: THE INTERMEDIATE CARE UNIT
Presenter: Joost Plate, MD, Netherlands

INTRODUCTION AND EVALUATION OF THE ACS "B-CON BASICS" COURSE IN ZARAGOZA, SPAIN
Presenter: Carlos Yanez, MD, Spain

VOLUME-OUTCOME RELATIONSHIP IN BURN CARE: ANALYSIS OF NATIONWIDE ADMINISTRATIVE DATABASE
Presenter: Akira Endo, MD, PhD, Japan

Session VIII: WTC I Session: Critical Care
Paper 1: 6:15am - 7:15am

CLINICAL, LABORATORY AND VENTILATORY PREDICTORS FOR INTRA-ABDOMINAL HYPERTENSION IN SEPTIC SHOCK ICU PATIENTS

Alcir E. Dorigatti MD, Bruno M. Pereira MD,Ph.D., Marina Z. Melek MD, Vitor F. Kruger MD, Jennifer L. Dos Santos Fernanda D. Teramoto Haline S. Batistoti MD, Fernanda V. De Freitas MD, Marcos A. Boes Roberta N. Aoki Cesar V. Carmona MD, Thiago M. Santos MD,Ph.D., Gustavo P. Fraga MD,Ph.D., University of Campinas

Introduction: Intra-Abdominal Hypertension (IAH) is a frequent complication in critically ill patients. According to the World Sociey of the Abdominal Compartment, physical examination is not an accurate diagnosis method and there are no predictive factors whatsoever. The objective of this study is to search for IAH predictors in ICU septic shock patients.

Methods: This is a prospective, single institution, observational study involving all septic shock patients admitted at the ICU between April and October 2016. Sepsis criteria was determined either by SEPSIS-3 and Surviving Sepsis Campaign concomitantly. Patients with primary abdominal pathologies were excluded. Intra-Abdominal Pressure (IAP) was assessed following WSACS protocols every 6 hours. Statistical analysis was performed using Generalized Estimation Equations (GEE) method. Level of significance was 5%.

Results: Twenty-five patients were followed up for 10 days of hospitalization. The mean age was 51.13 ± 16.52 years, 64% males. The pulmonary sepsis was present in 76% of the cases. The increase in IAP correlated with the increase in CVP ($p=0.0421$); PEEP ($p=0.0056$); ventilatory support pressure ($p=0.0015$); accumulated water balance (AWB) ($p=0.0273$) and SOFA ($p=0.0393$). Acidosis reduction ($p=0.0096$) and increase in bicarbonate ($p=0.0247$) in blood gas analysis were associated with lower IAP values. Cut points values for AWB, PEEP, SOFA, pH and bicarbonate were found.

Conclusion: Clinical, ventilatory and gasometric parameters can be used as predictors for IAH. Patients with values above the cut points should be actively monitored for IAH.

Session VIII: WTC I Session: Critical Care
Paper 2: 6:15am - 7:15am

EXTERNAL VALIDATION OF THE HELSINKI COMPUTED TOMOGRAPHY SCORE IN THE PREDICTION OF MORTALITY IN SEVERE TRAUMATIC BRAIN INJURY

Jose D. Charry MD,Ph.D., Juan P. Solano MD, Fundación Universitaria Navarra

Introduction:Traumatic Brain Injury (TBI) is a public health problem. It is a pathology that causes significant mortality and disability in Colombia. Different calculators and prognostic models have been developed in order to predict the neurological outcomes of these patients. The Helsinki computed tomography (CT) score was developed for prognostic purposes in TBI. We aimed to examine the accuracy of the prognostic discrimination and prediction of mortality of the Helsinki CT score in a cohort of trauma patients with severe TBI in a university Hospital in Colombia.

Methods:We analyzed 145 patients with severe TBI treated in a regional trauma center in Colombia over a 2 year period. Bivariate and Multivariate analyses were used. The discriminatory power of the score, its accuracy and precision was assessed by logistic regression and as the area under the receiver operating characteristic curve. Shapiro Wilks, chi2 and Wilcoxon test were used to compare the real outcomes in the cohort against the predicted outcomes.

Results:The median age of the patient cohort was 37 years, and 86.9% were male. The median injury severity score (ISS) was 27, the median GCS motor score was 3, the basal cisterns were closed in 37.93% of the patients and a midline shift of >5mm was seen in 41.98%. The six-month mortality was 24.8%, and the Helsinki CT score predicted a mortality of 26% p <0,0001 (AUC 0,724 IC 95% 0,628-0,820).

Conclusion:The Helsinki CT score predicted mortality at 6 months in patients with severe head trauma in a university hospital in Colombia. The Helsinki CT score is useful for predicting early death and the prognosis of patients with TBI.

Session VIII: WTC I Session: Critical Care
Paper 3: 6:15am - 7:15am

OPTIMIZING CRITICAL CARE OF THE TRAUMA PATIENT IN A COST-EFFICIENT WAY: THE INTERMEDIATE CARE UNIT

Joost Plate MD, Linda M. Peelen Ph.D., Luke P. Leenen* MD,Ph.D., Falco Hietbrink MD,Ph.D., UMC Utrecht

Introduction: The organization of specialized trauma care is an ongoing topic of debate, especially with regard to the critical care facilities needed to optimize patient outcome. The aim of this study was to describe the caseload, safety and cost-efficiency of critical care of the trauma patient provided at the surgical Intermediate Care Unit (IMCU).

Methods: This cohort study included all trauma admissions between 01.01.2011 and 01.07.2015 at the general ICU, stand-alone neurosurgical IMCU and stand-alone surgical IMCU of a level I trauma centre. Trauma mechanism, abbreviated injury scale (AIS) and injury severity scores (ISS), vital signs, laboratory parameters, admission duration, intubation duration, ICU transfer rate, and in-hospital mortality were prospectively collected. Expected cost savings were calculated using the cost price per IMCU ($1,500) and ICU ($2,500) admission day.

Results: A total of 1320 admissions were included, of which 645 (48.9%) at the ICU and 675 (51.1%) at the IMCU. Nearly all (n=620, 96.3%) ICU admissions were mechanically ventilated. The IMCU admissions had a mean age of 54.2 (CI 53.1, 55.3) and median ISS of 17 [IQR 11, 22]. The median duration of IMCU admission was 32.8 hours [IQR 18.8, 62.5]. At the IMCU one patient died due to a neurogenic shock. A subsequent ICU transfer was required in 38 (5.6%) IMCU admissions, after a median admission time of 28.1 [IQR 16.3, 51.0] hours. Of these transfers, 4 patients died due to neurological deterioration (cerebral herniation). Expected total cost savings due to the presence of the IMCU were $1,772,785.

Conclusions: A substantial amount of trauma patients in need of critical care can safely be admitted at the stand-alone specialist driven IMCU, without the need for further mechanical ventilation. Thereby, the IMCU fulfils an essential and cost-effective role in the management of severely injured trauma patients.

Session VIII: WTC I Session: Critical Care
Paper 4: 6:15am - 7:15am

INTRODUCTION AND EVALUATION OF THE ACS "B-CON BASICS" COURSE IN ZARAGOZA, SPAIN

Carlos Yanez MD, Antonio Guemes MD, Ana Navarro MD, Alberto Moreno MD, Jacqueline Vazquez MD, Lozano Blesa Clinical University Hospital

Introduction: Our commitment as fellows of the ACS is to spread and promote the principles of basic life saving techniques in massive bleeding patients using the methodology of the "B-Con Basics" course. This course in new in Spain and we consider it a very useful teaching tool for our society and for the public in general. Our objective was the introduction, development and evaluation of the Bleeding Control "B-Con Basics" course of the ACS among the college students and medical employees of the public health system of Aragon in the city of Zaragoza, Spain. We also set out to assess the degree of usefulness, relevance and applicability of the course content, as well as the overall satisfaction of the course valued among the study population of city of Zaragoza from December 2017 to March 2018.

Methods: To achieve our objectives we first had to obtain the official instructor accreditation for the "B-Con Basics" course in the US. We accomplished it by doing the regular course in October of 2018 in a level 1 Trauma Center in the state of California. Having obtained instructor accreditation, we organized in a public university hospital in Zaragoza and in the main university of the city an awareness campaign of the importance of the stop the bleeding. Subsequently we conducted from December 2017 to March 2018, 4 free access courses. Of the four courses 2 were done in the university hospital among nurses and physicians and 2 in the university for students. The methodology used for the evaluation of the activity among participants was to conduct an anonymous survey at the end of each course. The survey evaluated the variables of sex, age, occupation and personal opinion of the participants regarding the relevance, usefulness and applicability of the course content as well as the overall satisfaction. The surveys course content variables were classified with a quantitative scale from 0 to 10 and converting them to a qualitative scale of poor when graded from 0 to 3, fair from 4 to 6 and good from 7 to 10 for each of the four variables studied (relevance, usefulness, applicability and overall satisfaction), the rest of the variables were analyzed in percentages.

Results: From December of 2017 until March of 2018 we organized 4 courses in total with 83 assistants with an average of 20 participants per course. Most of the attendees were female 51(61%) vs. 32(39%) males and the age ranged from 21 to 52 with an average of 26 years. In the study population there were 46(56%) university students, 25(30%) hospital nurses and 12(14%) physicians. The results of the surveys for the course contents were broken down by category for each of the variables. Overall satisfaction and usefulness were the best valued with a good result by 70(84%) and 61(73%) of the participants respectively, followed by applicability and relevance with a good evaluation in 58(70%) and 55(66%). There were no poor results in any of the course content variables studied. In general, the attitude during the development of the courses was friendly and of interest to the trainees.

Conclusions: The ACS "B-Con Basics Course" is a good valued course for teaching the Basic techniques of hemorrhage control in the bleeding patient among university students and public health employees of Aragon, Spain. Its content was considered as good for relevance, usefulness and applicability by most of the studied population. The overall satisfaction was good for the population to witch it was taught in Zaragoza.

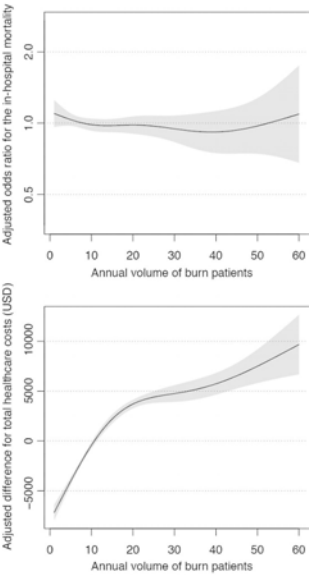
Session VIII: WTC I Session: Critical Care
Paper 5: 6:15am - 7:15am

VOLUME-OUTCOME RELATIONSHIP IN BURN CARE: ANALYSIS OF NATIONWIDE ADMINISTRATIVE DATABASE

Akira Endo MD,Ph.D., Atsushi Shiraishi MD,Ph.D., Kiyohide Fushimi MD,Ph.D., Yasuhiro Otomo* MD,Ph.D., Trauma And Acute Critical Care Medical Center, Tokyo Medical And Dental University Hospital Of Medicine

Introduction: Although hospital patient volume has been suggested to affect patient outcomes in several diseases, it has been still under debate whether this association could be observed in burn care. Assessment of healthcare costs based on burn patient volume has been scarce.

Methods: We conducted retrospective observational study including burn patients, using a Japanese national administrative database between 2010–2015. We established a case-mix adjustment model using burn index, patient demographic, and interventions in acute phase. A nonlinear generalized additive model (GAM) was used to evaluate the associations between hospital volume and the outcomes (in-hospital mortality and total healthcare costs per admission). Logistic or linear generalized estimating equation (GEE) models, adjusting for patient severity and hospital characteristics simultaneously, were also performed.



Results: Of 48,112 burn patients, 26,779 eligible patients from 1,316 hospitals (maximum of 58 burn patients annually) were analyzed. The case-mix adjustment model established had well accuracy with the area under receiver operating characteristics curve of 0.89. The GAM plots suggested little association between hospital volume and in-hospital mortality; however, the higher hospital volume was associated with the higher healthcare costs (Figure). While GEE models showed no significant association for in-hospital mortality [adjusted odds ratio (95% CI) = 1.00 (0.99–1.00), p = 0.336], a significant association was observed for healthcare costs [adjusted difference (95% CI) for each patient increase = $332 ($297–$368), p <0.001].

Conclusion: HHigh hospital volume was not associated with in-hospital mortality but significantly associated with high healthcare costs. Further study is needed with a range of higher hospital volume than this study.

WTC 5: Polytrauma/Ortho **Sponsored by German Trauma Society (DGU)**

Location: Harbor B, Second Level (Harbor Tower)

Moderators: Marius Keel, MD and Bertil Bouillon, MD, Switzerland and Germany
Keynote: Bertil Bouillon, MD, S3 Polytrauma Guideline Germany

ADMISSION OF ISOLATED HIP FRACTURE PATIENTS TO A TRAUMA SERVICE IMPROVES OUTCOMES
Presenter: Jerry Rubano, MD, USA

WHICH IS THE BEST TREATMENT FOR DISPLACED INTRA-ARTICULAR CALCANEAL FRACTURES: A SYSTEMATIC REVIEW AND NETWORK META-ANALYSIS
Presenter: Xu-Xiang Peng, BS, MS,China

WITHDRAWN

COMPARISON OF OUTCOMES IN SEVERE PELVIC FRACTURES BETWEEN A SOUTH KOREAN TRAUMA CENTER AND MATCHED PATIENTS TREATED IN THE UNITED STATES
Presenter: Kyoungwon Jung, MD, PhD, South Korea

HIP FRACTURE TIME-TO-SURGERY AND COMPLICATION/ MORTALITY RATE: IS THERE A SIGNIFICANT DIFFERENCE?
Presenter: Adel Elkbuli, MD, MPH, USA

Session VIII: WTC I Session: Polytrauma/Ortho
Paper 1: 6:15am - 7:15am

ADMISSION OF ISOLATED HIP FRACTURE PATIENTS TO A TRAUMA SERVICE IMPROVES OUTCOMES

Jerry Rubano MD, Marc Shapiro MD, Daniel N. Rutigliano MD, Jane E. McCormack RN, Emily C. Huang MS,James A. Vosswinkel MD, Randeep S. Jawa MD, Stony Brook University Hospital

Introduction: Isolated hip fracture (IHF) is a common injury in the elderly. In late 2014, in preparation for ACS verification, our trauma center changed admission practices for this group of patients so that they are largely admitted to the trauma service. Previously, IHF patients were most often admitted to a medical service. In this before-after quality assurance study, we evaluated the effects of this change on outcomes.

Methods: A retrospective review of the trauma registry at an ACS level I trauma center was performed for all elderly (age ≥65 years) blunt trauma patients discharged between 2013 and 2016, with a focus on patients with IHF. IHF was defined as a fracture of the femoral head, neck, and/or trochanteric region with no other injuries other than minor skin or soft tissue injuries, occurring after a fall. Comorbidities and complications were recorded concurrently, and as defined by the annually revised National Trauma Data Standard data dictionary.

Results: There were 3437 geriatric blunt trauma admissions. Of these, 656 (19.1%) had an isolated hip fracture, 264 were admitted before change and 298 were admitted after the change in admission practice. The patients were generally female, had comparable median age and comorbid conditions (Table). Both had ISS of 9. After the change, hospital length of stay (LOS) remained similar (7 [IQR 5-9] vs 7 days [IQR 6-10], p=0.27), but more patients were admitted to the stepdown unit (68.2% vs 19.8%, p<0.001) and to the ICU (5.1% vs 0.4%, p<0.001) than before the change. Fewer patients were admitted to the floor (after 8.9% vs 75.9% before, p<0.001) . After this change in our practice, fewer patients developed a complication (10.7% vs 17.4%, p=0.02) than before. Discharge disposition was not significantly different, with the majority of patients in both groups being discharged to rehabilitation facilities (80.5% after vs 79.5% before, p=0.77). While the percentage of patients with in-hospital mortality decreased to 0.7% after the change from 1.5% before, this did not reach statistical significance (p=0.33).

Conclusion: Nearly 20% of our elderly blunt trauma admissions, excluding ED deaths and burns, were for IHF. After implementing a practice change of admitting elderly isolated hip fracture patients to the trauma service, fewer patients developed complications. This reduction in complications corresponds to an increase in the intensity of care provided, as measured by increased step-down and ICU utilization. Likely, patient admission to a single unified trauma service with protocols and a unified qualified assurance process contributed.

	Before Change (2013-2014)	After Change (2015-2016)	p-value
n	264	298	n/a
Age (years, median, IQR)	83 (77.5-89)	83 (77-88)	0.77
Female gender (%)	66.7%	64.8%	0.64
≥2 comorbidities (%)	75.8%	78.2%	0.49
Fall from < 3 feet (%)	98.5%	97.7%	0.48
Admitting service (%):			
Medical	67.8%	8.1%	<0.001
Trauma	5.7%	87.6%	<0.001
Orthopedics	26.5%	4.4%	<0.001

Session VIII: WTC I Session: Polytrauma/Ortho
Paper 2: 6:15am - 7:15am

WHICH IS THE BEST TREATMENT FOR DISPLACED INTRA-ARTICULAR CALCANEAL FRACTURES: A SYSTEMATIC REVIEW AND NETWORK META-ANALYSIS

Xu-Xiang PENG BS, Master of Surgery, Xiao-Min WU BS, Master of Surgery, Yu PAN MD, Chun-Ye LI MD, Bao-An People's Hospital, Affiliated To Southern Medical University & Affiliated To Guangdong Medical University

Introduction: Displaced Intra-Articular Calcaneus Fractures (DIACFs) represent a source of tremendous disability to the patient, economic burden to the society and a treatment challenge to the average orthopaedic surgeon. Open reduction and internal fixation (ORIF), minimally invasive surgery (MIS), external fixator (EF), external fixator combined with limited internal fixation (EFLIF) and non-surgical treatment (NST) are mostly used for the treatment of DIACFs. However, no single approach is universally applicable to all calcaneus fractures. More over, previous studies was still unclear and have offered conflicting recommendations. The purpose of this study is to comprehensively review the literature and ascertain the relative efficacy and safety of ORIF, MIS, EF, EFLIF and NST for patients with DIACFs using a Bayesian network meta-analysis.

Methods: We will comprehensively search PubMed, EMBASE, Cochrane Library, Medline, Science Direct, CBM and CNKI from the inception dates to January 01, 2018, to include potentially relevant randomized controlled trials (RCTs) and cohort studies (CSs) that evaluated interventions for treating adults with DIACFs. The quality of included studies was assessed using the Newcastle-Ottawa Scale and the risk of bias according to the Cochrane Handbook. After independent study selection by 2 authors, data were extracted and collected independently. The primary outcome measures were anatomical measures, functional measures, and complications. The data of RCTs and CSs were pooled respectively using the fixed-effect model or random-effect model. Mean differences (MDs) with 95% confidence intervals (CIs) were calculated for continuous data, and relative risks (RRs) with 95% CIs were calculated for dichotomous data.

Statistical heterogeneity was assessed with the Q test and I^2. Sensitivity analysis was developed to assess the reliability of pooled results.

Results: Seventeen trials (5 RCTs and 12 CSs) including 2369 patients were considered in the study. EFLIF had significantly the highest AOFAS Ankle Hindfoot Scale (MD, 9.54 [95% CI, 5.97 to 17.42]) and lower total incidence of complications (RR, 1.65 [95% CI, 1.27 to 2.54]) than ORIF, MIS, EF and NST. Moreover, EFLIF resulted in a lower incidence of additional surgery (RR, 3.47 [95% CI, 2.28 to 6.95]) than ORIF and NST. The rank of anatomical recovery was: EFLIF, ORIF, EF, MIS and NST. The rank of functional recovery was: EFLIF, ORIF, MIS, EF and NST. For reduction in total incidence of complications, the rank was: EFLIF, NST, EF, MIS and ORIF.

Conclusion: EFLIF has the highest probability of improving the functional outcome and reducing the total incidence of complications and additional surgery among the five interventions for treating adults with DIACFs.

PAPER 3 - WITHDRAWN

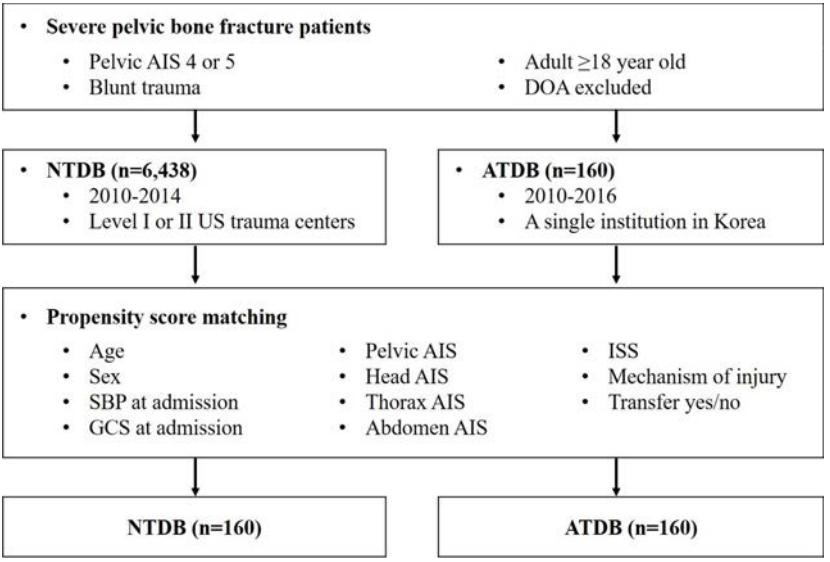
Session VIII: WTC I Session: Polytrauma/Ortho
Paper 4: 6:15am - 7:15am

Comparison of outcomes in severe pelvic fractures between a South Korean trauma center and matched patients treated in the United States.

Kyoungwon Jung MD,Ph.D., Shokei Matsumoto* MD, Alan Smith Ph.D., Kyungjin Hwang MPH,RN, John Cook-Jong Lee MD,Ph.D., Ajou University School Of Medicine

Introduction: This study aimed to compare treatment outcomes between patients with severe pelvic fractures at a representative trauma center which was established in Korea since 2015 and matched cases in the United States.

Methods: Two cohorts were selected from a single institution trauma database in South Korea (ATDB) and the National Trauma Data Bank (NTDB) in the United States (US). Adult blunt trauma patients with a pelvic Abbreviated Injury Scale >3 were included. Patients were matched based on covariates that affect mortality rate using a 1:1 propensity score matching (PSM)



approach. We compared differences in outcomes between the two groups, performed survival analysis for the cohort after PSM, and identified factors associated with mortality. Lastly, we analyzed factors related to outcomes in the ATDB dataset comparing a period prior to the implementation of the trauma center according to US standards, an interim period, and a post-implementation period.

Results: After PSM, a total of 320 patients (160 in each cohort) were identified for comparison. In-hospital mortality was significantly higher in the ATDB cohort using chi-square test, but it was not statistically significant when using Kaplan-Meier survival curves and Cox regression analysis. Moreover, the mortality rate was similar comparing the NTDB cohort to ATDB data reflecting the post-trauma center establishment period. Older age, lower SBP and GCS on admission were factors associated with mortality.

Conclusion: Mortality rate following severe pelvic fractures was significantly associated with older age, lower SBP and GCS scores on admission. Efforts to establish a trauma center in South Korea led to improvement in outcomes, which are comparable to those in US centers.

Session VIII: WTC I Session: Polytrauma/Ortho
Paper 5: 6:15am - 7:15am

HIP FRACTURE TIME-TO-SURGERY AND COMPLICATION/ MORTALITY RATE: IS THERE A SIGNIFICANT DIFFERENCE?

Adel Elkbuli MD,MPH, Alyssa Ely BS, M.Ed, Valerie Polcz BS, MS, Brenda Benson RN, Eileen Bernal MD, Mark McKenney MBA,MD, Shaikh Hai MD, FACS, Dessy Boneva MD, Kendall Regional Medical Center

Introduction: Post-operative complications impose a significant burden on patient outcomes and cost of medical care. Our aim was to determine the relationship between time to surgery and post-operative complications/mortality in patients with hip fracture.

Methods: A retrospective review of data collected from our institution's trauma registry for adult patients with hip fracture and subsequent repair from 2015-2017. Patients were stratified into two groups based on time to surgery after admission 24-48 hours (Group 1) vs >48 hours (Group 2). Demographic variables included age, gender, race, and Injury Severity Score (ISS). Outcome variables included Intensive Care Unit Length of Stay (ICU-LOS), DVT/PE rate, mortality, and readmission status. ANOVA was used for data analysis with statistical significance defined as p-value <0.05.

Results: A total of 485 patients with hip fracture required surgical intervention. Of those, 460 had surgery at <24-48 hours, and 25 had surgery >48 hours post-admission. Average ISS was the same in both groups. The average ICU-LOS was statistically significant higher in >48 hours group compared to <24-48 hour group (4 vs 2) (p-value <0.0002). There was no statistically significant difference between groups when comparing DVT/PE rate, 30-day readmission, or mortality.

Conclusion: Time to surgery may affect overall ICU-LOS in patients with hip fracture requiring surgical intervention. Time to surgery does not affect complication rates or mortality. Future research should investigate long-term outcomes such as functional status and Disability-Adjusted Life Years.

Table 1. Comparing time to operation vs outcomes in patients with isolated hip fracture

	Time to operation 24-48 hours	Time to operation >48 hours	p-value
Total# of patients with isolated hip fracture	460	25	0.001
Gender Female	75%	76%	>0.05
Race White Other	98% 2%	96% 4%	>0.05
Age in years (mean)	84	85	0.14
Average ISS	9	9	>0.05
DVT/PE	0.50%	0%	>0.05
Readmission rate at 30 days	3%	4%	>0.05
ICU-LOS (Days)	2	4	<0.0002
Mortality rate	3%	0%	>0.05

WTC 6: Geriatrics **Sponsored by ESTES**

Location: Harbor A, Second Level (Harbor Tower)

Moderators: Ingo Marzi, MD and Christoph Josten, MD, Germany
Keynote: Christoph Josten, MD, The New Classifications of Fragility Fractures of the

IMPLEMENTATION OF NEW STANDARD OPERATING PROCEDURES: WHAT ARE THE BENEFITS FOR GERIATRIC TRAUMA PATIENTS WITH MULTIPLE INJURIES.
Presenter: Kai Jensen, MD, Switzerland

CHARACTERISTICS OF TRAUMA MECHANISMS AND ANATOMICAL DISTRIBUTION OF INJURY IN GERIATRIC PATIENTS; A DESCRIPTIVE ANALYSIS OF THE NATIONWIDE TRAUMA REGISTRY OF THE WORLD'S FASTEST AGING COUNTRY
Presenter: Mitsuaki Kojima, MD, PhD, Japan

EMERGENCY/TRAUMA SURGEONS REPORT PRESCRIBING LESS OPIOIDS OVER TIME
Jamie Anderson, MD, MPH, USA

TRAFFIC ACCIDENTS FOR GERIATRIC CYCLIST IN JAPAN
Presenter: Yuta Oyama, MD, Japan

PREDICTION OF MORTALITY AND MORBIDITY EVALUATING WITH SARCOPENIA IN JAPANESE GERIATRIC TRAUMA PATIENTS
Presenter: Takeshi Nishimura, MD, Japan

Session VIII: WTC I Session: Geriatrics
Paper 1: 6:15am - 7:15am

Implementation Of New Standard Operating Procedures: What Are The Benefits For Geriatric Trauma Patients With Multiple Injuries.

Kai O. Jensen MD, Lorenz Peterer MD, Georg Osterhoff MD, Ladislav Mica MD, Hans P. Simmen MD, Hans C. Pape MD, Kai Sprengel MD, University Hospital Zurich

Introduction: The demographic changes towards ageing of the populations in developed countries imposes a challenge to trauma centers, as geriatric trauma patients require specific diagnostic and therapeutic procedures. This study investigated whether the integration of new standard operating procedures (SOPs) for the resuscitation room (ER) has an impact on the clinical course in geriatric patients. The new SOPs were designed for severely injured adult trauma patients, based on the Advanced Trauma Life Support (ATLS) and imply early whole-body computed tomography, damage control surgery, and the use of goal-directed coagulation management. We investigated whether there were changes in the in-hospital mortality, infection rate, and rate of palliative care after the implementation of new SOPs.

Methods: Single-center cohort study. We included all patients >= 65 years of age with an Injury Severity Score (ISS) >= 9 who were admitted to our hospital primarily via ER. A historic cohort was compared to a cohort after the implementation of the new SOPs. Person's chi-square, Fisher's exact and Mann–Whitney U test were used to compare the treatments. Binary logistic regression analysis was conducted to measure the strengths of associations and to identify possible risk factors.

Results: We enrolled 311 patients who met the inclusion criteria between 2000–2006 (group PreSOP) and 2010–2012 (group SOP). In group SOP, the mortality rate was significant lower (64.1% vs. 44.4%; standardized mortality ratio 0.90 vs. 0.70, P = .001) whereas the rate of infections (21.4% vs. 21.9%) and palliative care (23.7% vs. 28.3%) was comparable and not significant different with group PreSOP. TBIs were the leading cause of death in both time periods (60.2% vs. 72.5%). However, the rate of exsanguinating patients decreased from 26.5% to 7.5%. This benefit was seen only for severely injured patients (ISS ≥ 16), but not for moderately injured patients (ISS 9–15).

Differences in mortality and infection rates between 2000–2006 (group *Pre*SOP) and 2010–2012 (group SOP). ISS: Injury Severity Score; PT: prothrombin time.

Outcome	Subgroup	*Pre*SOP [n] / %	SOP [n] / %	*P*-value
Mortality rate	ISS = 9–15	4 / 28.6%	7 / 20.6%	.71*
	ISS ≥ 16	80 / 68.4%	73 / 50.0%	.003‡
Infection rate	ISS = 9–15	1 / 7.1%	5 / 14.7%	.66*
	ISS ≥ 16	27 / 23.1%	34 / 23.6%	.92‡

*Fisher's exact, ‡Pearsons's chi-square.

Conclusion: Our findings suggest that the implementation of new SOPs comprising early whole-body CT, damage control surgery, and the use of goal-directed coagulation management significantly reduced the mortality rate in severely injured geriatric trauma patients, whereas moderately injured patients seemed not obtain the same benefit and with no influence on the infection rate. Further research is needed to improve the outcomes for this fast-growing population.

Session VIII: WTC I Session: Geriatrics
Paper 2: 6:15am - 7:15am

CHARACTERISTICS OF TRAUMA MECHANISMS AND ANATOMICAL DISTRIBUTION OF INJURY IN GERIATRIC PATIENTS; A DESCRIPTIVE ANALYSIS OF THE NATIONWIDE TRAUMA REGISTRY OF THE WORLD'S FASTEST AGING COUNTRY

Mitsuaki Kojima MD,Ph.D., Akira Endo MD,Ph.D., Atsushi Shiraishi MD,Ph.D., Yasuhiro Otomo MD,Ph.D., Tokyo Medical and Dental University

Introduction: The burden of trauma among elderly patients has been increasing in developed countries and is characterized by a higher prevalence of post-injury mortality and requirement of more substantial healthcare resources. People aged 65 years and older comprised 26.7% of the entire Japanese population in 2015 and were nearly twice that of the United States. We performed a comprehensive analysis of Japan's nationwide trauma registry that may include the highest proportion of the aged population to study the age-related changes in characteristics of trauma patients.

Method: We performed a retrospective observational study of the Japan Trauma Data Bank between 2004 and 2015 to evaluate the age-related changes in mechanisms, anatomical distribution of injury and injury severity, physiological status, and outcomes of trauma patients. Characteristics of the trauma patients were assessed according to age, which was categorized into 10-year intervals. The nonlinear correlation between age and in-hospital mortality of trauma patients were assessed using a generalized additive model (GAM) where the model was adjusted for both anatomy- and physiology-based trauma severity (Injury Severity Score [ISS] and Revised Trauma Score), and age was incorporated into the model as a continuous variable.

Results: Of a total of 128,036 severe trauma patients (ISS ≥9) included in the analysis, 67,279 (52.5%) patients were 60 years or older. The proportion of the elderly patients aged ≥ 60 years increased from 31.4% to 59.1% over the observation period. The majority of trauma in the older groups was caused by ground-level falls, while younger groups experienced high-energy mechanisms such as traffic accidents (Figure 1). The proportions of lower extremity injuries were higher among those aged 70 years and older (31.6%, 50.1%, and 70.5% corresponded to the 70-79, 80-89 and 90+ year age groups, respectively) in comparison to the younger groups (26.1% among those younger than 60 years). The GAM plot revealed that the adjusted odds ratio for in-hospital mortality increased monotonically with increasing age (Figure 2).

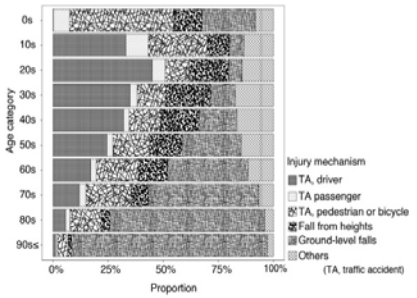


Figure 1. Proportions of injury mechanisms according to age groups

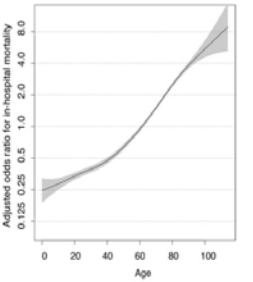


Figure 2. Relationship between age and adjusted odds ratio for in-hospital mortality

Conclusion: Here, we described the unique mechanism of injury and pattern among elderly trauma patients, as well as age-related increase in risk for in-hospital mortality. These results may provide valuable information to societies faced with aging to recognize the specialty of geriatric trauma care.

Session VIII: WTC I Session: Geriatrics
Paper 3: 6:15am - 7:15am

EMERGENCY/TRAUMA SURGEONS REPORT PRESCRIBING LESS OPIOIDS OVER TIME

Jamie E. Anderson MD,MPH, Christine S. Cocanour MD, Joseph M. Galante MD,
University Of California, Davis

Introduction: Confronted with the opioid epidemic, surgeons must play a larger role to reduce risk of opioid abuse while managing acute pain. Having a better understanding of the beliefs and practices of emergency/trauma surgeons regarding discharge pain management may offer potential targets for interventions beyond fixed legal mandates.

Methods: An IRB-approved electronic survey was sent to emergency/trauma surgeons who are members of AAST, and separately, emergency/trauma surgeons and nurse practitioners at a Level I Trauma Center in February 2018. The survey included 4 case-based scenarios and questions about discharge prescription practices and beliefs.

Results: Of 66 respondents, most (88.1%) were at academic institutions. Mean number of opioid tablets prescribed was 20-30 (range 5-90), with the fewest tablets prescribed for elective laparoscopic cholecystectomy and the most for rib fractures. Few prescribed both opioid and non-opioid medications (22.4-31.4%). Most would not change the amount, dose, or type of medication prescribed at discharge (53.9%-83.1%) if patients used opioids regularly prior to their hospitalization. The most common factors that made providers more likely to prescribe opioids were high opioid use in the hospital (32.4%), history of opioid use/abuse (24.5%), and if the patient lives far from the hospital (12.9%). The most common factors that made providers less likely to prescribe opioids were frailty (24.4%), older age (23.3%), low body-mass index (7.6%), and history of drug/alcohol abuse (7.6%). Most providers (56.9%) give patients detailed instructions on how to wean off opioids. Less than half (47.0%) reported their hospital has prescriptive opioid practice guidelines. For providers in practice >5 years, most reported a decrease in opioids (71.9%) and an increase in non-opioids prescribed (76.6%) at discharge.

Conclusion: Emergency/trauma surgeons and nurse practitioners reported decreasing the number/amount of opioids prescribed over their practice. Patients with high opioid use in the hospital, history of opioid use/abuse, or who live far from the provider may be prescribed more opioids at discharge. Offering detailed instructions for weaning opioids and hospital-based practice guidelines are potential interventions to help decrease risk of opioid abuse.

Session VIII: WTC I Session: Geriatrics
Paper 4: 6:15am - 7:15am

TRAFFIC ACCIDENTS FOR GERIATRIC CYCLIST IN JAPAN

Yuta OYAMA MD, Takashi FUJITA MD,Ph.D., FACS, Shinji NAKAHARA MD,Ph.D., Yasufumi MIYAKE MD,Ph.D., Tetsuya SAKAMOTO MD,Ph.D., Teikyo University School of Medicine

Introduction: Traffic injuries among the elderly are increasing in Japan. A bicycle is an important transportation for elderly people who are not able to walk long distance or drive a car. The purpose of this study was to describe injured body regions among the elderly cyclists compared with young population and the fatal injuries among them with the sample of Japan Trauma Data Bank (JTDB).

Methods: We extracted data of cyclist injuries from the JTDB2016. Those with complete data of Age, ISS, Max AIS of 9 body region, and mortality were analyzed. The subjects were divided into two groups by age. Yong group(YG) was defined as the age from15 to 64 and old group(OG) was done as more than 65. We also conducted subgroup analysis for old group between the survived and dead. Mann-Whitney's U test was used for non-parametrical analysis.

Results: In YG, 120037 subjects were extracted and median ISS(IQR) was 13(9-21). In OG, for 4618 subjects, median ISS(IQR) was 16(9-25) ($p<0.001$). Median Max AISs(IQR) for head, abdomen and spine by YG vs. OG were 3(2-4) vs.4(3-4) ($p<0.001$), 2(2-3) vs.2(2-3) (pΩ 0.001), 2(2-4) vs.3(2-4) ($p<0.001$) respectively. Subgroup analysis for OG revealed that Median(IQR)of Max AISs compared death to survive were 5(4-5) vs.3(3-4) ($p<0.001$) in head, 4(3-4) vs.3(2-4) ($p<0.001$) in chest, 3(2-4) vs. 2(2-3) ($p<0.001$) in abdomen.

Conclusion: Geriatric cyclists tended to sustain severe injuries in their head, abdomen and spine. For 65 and over population, severe injuries in head, chest and abdomen were associated with mortality. We must advocate more strongly about helmet wearing for geriatric cyclist. Prevention for chest injury and abdominal injury is the next target of intervention by medicine-engineering collaboration.

		65+				15-65					survive-				survive+				
		n	Median(IQR)			n	Median(IQR)			p	n	Median(IQR)			n	Median(IQR)			p
Max AIS	Head	4478	3	2	4	3007	4	3	4	0.000	666	5	4	5	2209	3	3	4	0.000
	Neck	2005	1	1	2	887	1	1	2	0.129	101	1	1	2	744	1	1	2	0.187
	Face	57	1	1	2	24	1	1	2.75	0.961	4	3	1.5	3.75	20	1	1	1.75	0.056
	Chest	1877	3	3	4	1236	3	3	4	0.417	293	4	3	4	888	3	2	4	0.000
	Abd.	620	2	2	3	334	2	2	3	0.000	96	3	2	4	224	2	2	3	0.000
	Spine	1285	2	2	4	743	3	2	4	0.030	94	2	2	3	624	3	2	4	0.093
	Upper Ext	1949	2	1	2	1166	2	1	2	0.467	140	2	1	2	960	2	1	2	0.196
	Lower Ext	2447	2	1	3	1872	3	2	3	0.000	280	3	2	4	1495	3	2	3	0.000
	Surface	516	1	1	1	219	1	1	1	0.448	35	1	1	1	171	1	1	1	0.431
ISS		7136	13	9	21	4466	16	9	25	0.000	723	26	25	38	3526	14	9	21	0.000

Session VIII: WTC I Session: Geriatrics
Paper 5: 6:15am - 7:15am

Prediction of Mortality and Morbidity evaluating with Sarcopenia in Japanese Geriatric Trauma Patients

Takeshi Nishimura MD, Shigenari Matsuyama MD, Satoshi Ishihara Ph.D., Shinichi Nakayama Ph.D., Hyogo Emergency Medical Center

Introduction: Sarcopenia is assumed as a predictor of the poor outcome after surgery. However, an association between a prognosis of trauma and sarcopenia has not been documented well. The purpose of this study was to evaluate the outcome of trauma with sarcopenia, by comparing it with non-sarcopenia in the Japanese elderly patients. We hypothesized that sarcopenia had a great influence on the outcome of geriatric trauma.

Methods: Medical records of over 65-year-old trauma patients, who were transported to our center from 2010 to 2017, were retrospectively reviewed. Psoas muscle index (PMI), where total psoas muscle area at L3 level on computed tomography on arrival divided by body surface area, was measured in each case. Sarcopenia was defined that PMI was less than lower inter quartile range in each gender. Patient's background, Injury Severity Score (ISS), mortality, and morbidity were analyzed. Via a questionnaire mailed to the patients, 1-year survival and activity of daily living (Barthel index) were obtained.

Results: Overall, 405 patients were included in this study. There were 101 in Sarcopenia group (S) and 304 in Non-sarcopenia group (NS). Patients' background and ISS were not significantly different. Concerning morbidity, more pneumonia tended to occur in S (S; 17.5% vs NS; 23.8%, p=0.065), but numbers of cases, complicating urinary tract infection and venous thromboembolism, were similar in both groups. It was noted that mortality was higher in S than NS (S; 15.8% vs NS; 7.9%, p=0.032). Although 169 patients answered the questionnaires, the results had no significant difference between groups.[1-year survival: 34/37 (91.9%) in S vs 118/132 (89.4%) in NS. Barthel index; 100 (63.5-100) in S vs 100 (75-100) in NS].

Conclusion: Sarcopenia, defined by PMI, can be a trusted predictor in mortality among geriatric trauma patients.

WTC 7: Emergency General Surgery **Sponsored by WSES**

Location: Coronado B, Fourth Level (Harbor Tower)

Moderators: Mauro Zago, MD and Salomone Di Saverio, MD, FRCS (Eng), Italy and United Kingdom

Keynote: Salomone Di Saverio, MD, FRCS (Eng), Acute Appendicitis GL

MATCHING THREE CLINICAL SCORES WITH SURGEON-PERFORMED ULTRASOUND IN THE DIAGNOSIS OF ACUTE APPENDICITIS: PRELIMINARY RESULTS OF A PROSPECTIVE STUDY
Presenter: Mauro Zago, MD, Italy

PROGNOSTIC VALUE OF P-POSSUM AND OSTEOPENIA FOR PREDICTING MORTALITY AFTER EMERGENCY LAPAROTOMY IN GERIATRIC PATIENTS
Presenter: Rebecka Ahl, MD, Sweden

REBOA: NOT JUST FOR TRAUMATIC HEMORRHAGIC SHOCK ANYMORE
Presenter: Joseph Ibrahim, MD, USA

DAMAGE CONTROL OR DEFINITIVE REPAIR? A RETROSPECTIVE AUDIT OF ABDOMINAL TRAUMA AT A SOUTH AFRICAN CENTRE.
Presenter: Ross Weale, MBBS, BSc, South Africa

A CHANCE TO CUT: DEFINING A NEGATIVE EXPLORATION RATE IN PATIENTS WITH SUSPECTED NECROTIZING SOFT TISSUE INFECTION
Presenter: Erin Howell, MD, USA

Session VIII: WTC I Session: Emergency General Surgery
Paper 1: 6:15am - 7:15am

MATCHING THREE CLINICAL SCORES WITH SURGEON-PERFORMED ULTRASOUND IN THE DIAGNOSIS OF ACUTE APPENDICITIS: PRELIMINARY RESULTS OF A PROSPECTIVE STUDY

Mauro Zago* MD, Samantha Bozzo MD, Alessia Malagnino MD, Claudio Gianotti MD, Giulia Carrara MD, Maria Masutti MD, Diego Mariani MD, Matteo Zago Ph.D., BME
Policlinico San Pietro

Introduction: Clinical scores are used in clinical practice as a tool for diagnosing acute appendicitis, such as the Alvarado, Acute Inflammatory Response Score (AIR), and the Adult Appendicitis Score (AAS). At present, no studies integrating ultrasound (US) with all the three clinical scores are available in literature.
Methods: Eighty-one patients (pts) with a suspicion of acute appendicitis were prospectively enrolled (37 M, 44 F). The Alvarado and AIR scores were calculated for all pts, the AAS for adult pts only (> 18 y/o). Stratification consisted of 3 groups for each score: low , intermediate, and high probability of acute appendicitis. A surgeon-performed US completed the assessment. Differences between proportions of positive US (US+) vs. negative US (US-)/other diagnosis were tested within each score level using "N-1" Chi-squared tests. 95% Confidence Intervals (95%CI) were also computed. Accuracy, sensitivity and specificity of US were computed. Significance level was set at alpha = 0.05. A phone follow-up was done on non operated pts at three months.
Results: US sensitivity, specificity and accuracy in the overall population are shown on Table 1. US was positive in 27, negative in 41 (1 false negative in an adult, 1 in a child), and in 13 obtained an alternative diagnosis. Hystology confirmed appendicitis in all operated pts. The phone follow-up excluded relapse of symptoms or appendectomy in all US- pts. The comparison between US+ vs. US-/other diagnosis in the overall population is shown in Table 2. The rate of pts with US proved appendicitis in the low probability groups ranges from 17,1% (Alvarado) to 19,2% (AIR) [p<0.001]. Conversely, 23,5% in the high probability Alvarado score had appendicitis, only 27,5% in the intermediate [p<0.003 and 0.001, respectively]. Among AIR intermediate score pts, 42,8% had no appendicitis (p=NS). Table 3 shows the comparison of proportions in the adult population (all scores). AAS got 81% of US+ in the intermediate risk group.
Conclusion: Surgeon-performed US can potentiate the accuracy of clinical decision making. Whatever is the therapeutic strategy (non-operative vs. surgery), US reduces both over- and under-treatment rates. Its role seems higher in the low probability groups for all scores, avoiding undiagnosed appendicitis (17-29%). AIR score seems unreliable in the intermediate risk group (> 40% of US-). Its use in algorithms without imaging should be questioned.

	Value (%)	95% CI
Sensitivity	93,1	81.7-99.9
Specificity	100	91.2-100.0
Accuracy	97,5	92.1-99.9

Table 1: results of US diagnostic tests.

		US+		US- / other diagnosis			
SCALE	SCORE	COUNT	CI (%)	COUNT	CI (%)	χ^2	p
Alvarado	≤ 4	6/35	8.1-32.7	29/35	67.3-91.9	30,06	<0.001
	5-8	8/29	14.7-45.7	21/29	54.3-85.3	11,04	<0.001
	≥ 9	13/17	52.7-90.4	4/17	9.6-47.3	8,93	0,003
AIR	≤ 4	10/52	10.8-31.9	42/52	68.1-89.2	39,59	<0.001
	5-8	16/28	39.1-73.5	12/28	26.5-60.9	1,08	0,299
	9-12	1/1	20.7-100	0/1	0-79.4	1,00	0,317

Table 2: proportions and 95% Confidence Intervals of proportions (CI %) for all patients (n=81), according to the evaluation scale; p: "N-1" Chi-squared test.

		US+		US- / other diagnosis			
SCALE	SCORE	COUNT	CI (%)	COUNT	CI (%)	χ^2	p
Alvarado	≤ 4	6/24	12.5-45.0	18/24	55.1-88.4	11,75	<0.001
	5-8	7/21	17.3-55.2	14/21	45.4-81.9	4,46	0,035
	≥ 9	10/14	44.8-88.1	4/14	11.9-54.7	4,76	0,029
AIR	≤ 4	9/36	14.2-41.4	27/36	59.3-85.8	17,75	<0.001
	5-8	13/22	39.4-77.2	9/22	22.8-61.4	1,39	0,238
	9-12	1/1	20.7-100	0/1	0-79.4	1,00	0,317
AAS	≤ 10	14/48	18.2-43.4	34/48	56.8-82.1	14,83	<0.001
	11-15	9/11	52.1-94.9	2/11	5.1-47.7	8,60	0,003
	≥ 16	0	NA	0	NA	NA	

Table 3: proportions and 95% Confidence Intervals of proportions (CI %) for all patients aged ≥18 (n=59), according to the evaluation scale; p: "N-1" Chi-squared test.

PROGNOSTIC VALUE OF P-POSSUM AND OSTEOPENIA FOR PREDICTING MORTALITY AFTER EMERGENCY LAPAROTOMY IN GERIATRIC PATIENTS

Rebecka Ahl MD, Xin Fang PhD student, Hakan Geijer MD,Ph.D., Kardo Taha MD, Sahar Pourhossein MD, Peep Talving* MD,Ph.D., Olle Ljugqvist MD,Ph.D., Shahin Mohseni MD,Ph.D., OREBRO University Hospital, Sweden

Introduction: Portsmouth - Physiological and Operative Severity Score for the enumeration of Mortality and Morbidity (P-POSSUM) score is widely utilized for operative mortality prediction. Its applicability to emergency laparotomy operations in geriatric patients is lacking. The present study evaluates the P-POSSUM in a comparison with other risk factors for mortality including osteopenia as an indicator for frailty in geriatric patients subjected to emergency laparotomy.

Methods: Retrospective analysis of all consecutive patients (≥ 65 years) subjected to an emergency laparotomy between 1/2015 and 12/2016. Data accrued included demographics, pre-operative laboratory values, Charlson's co-morbidity index, American Society of Anesthesiologist (ASA) Score, indication and type of operation, osteopenia, P-POSSUM score, post-operative complication, ICU and hospital length of stay, and 30-day mortality. Association between prognostic markers and 30-day mortality was assessed using log-binomial regression model. Confounding variables were selected using backward stepwise method. Prognostic value was evaluated using receiver operating characteristic (ROC) curve and Youden's J statistic was used to find optimum cut-off point.

Results: A total of 209 patients were available for analysis. The main surgical procedures were small bowel resection, adhesiolysis, large bowel resection, diverting stoma, and miscellaneous procedures at 15% (n=31), 18% (n=38), 21% (n=43), 16.7% (n=35), and 30% (n=62), respectively. Poor association was observed between P-POSSUM and mortality [relative risk (RR)=1.01, 95% (CI): 1.00 - 1.02, p=0.21]. Also, a poor prognostic value for 30-day mortality (area under ROC=0.49) was noted. According to Youden's optimum cut-off point on the ROC curve, the optimal sensitive and specificity for P-POSSUM were 0.26 and 0.83 respectively. Age, systolic BP, ASA= 4, BMI, PRBC transfusions and postoperative infections were associated with 30-day mortality. Osteopenia was not statistically significant in multivariate analysis (adj. RR=1.05, 95% CI: 0.67 – 1.66, p=0.82). Multivariate log-binomial regression model outperformed the P-POSSUM (c^2=28.61, p<0.001). However, osteopenia contributed little to the prognostic value of the regression model (area under ROC increases from 0.8087 to 0.8092).

Conclusion: The P-POSSUM and osteopenia performed poorly in prediction of 30-day post emergency laparotomy mortality. External validation of these findings is warranted.

Session VIII: WTC I Session: Emergency General Surgery
Paper 3: 6:15am - 7:15am

REBOA: NOT JUST FOR TRAUMATIC HEMORRHAGIC SHOCK ANYMORE

Joseph A. Ibrahim MD, Karen Safcsak RN, Michael L. Cheatham MD, Orlando Health

Introduction: Resuscitative endovascular balloon occlusion of the aorta (REBOA) effectively improves survival among traumatically injured patients with uncontrolled hemorrhagic shock. REBOA can also be used in non-trauma patients with similar success. We report our experience using REBOA in obstetric, general surgery, and cardiology patients.

Methods: REBOA has been used extensively in our Level 1 trauma center with relatively high success (56% survival rate). As part of our hospital quality improvement process, we identified several non-trauma indications where rapid control of hemorrhage could be beneficial. The concept of REBOA was introduced to the non-trauma surgical services including the 24/7 availability of trauma surgeons to perform REBOA. All non-trauma REBOA insertions were reviewed.

Results: 6 non-trauma patients underwent REBOA for hemorrhagic or cardiogenic shock. Two emergent and 1 elective obstetric REBOA insertions were performed for either placenta previa or accreta. Both emergent patients were in profound hemorrhagic shock requiring massive transfusion protocol; 1 was in cardiac arrest. REBOA was performed without complication and all 3 patients survived to be discharged home. One elective splenectomy patient developed profound hemorrhage intra-operatively. REBOA was performed allowing the procedure to be completed with little additional blood loss. The patient subsequently had care withdrawn due to their medical comorbidities. One pancreaticoduodenectomy patient returned 3 weeks post-operatively with acute hemorrhage from the right hepatic artery. REBOA was performed, controlling the hemorrhage and rescuing the patient allowing them to be discharged home. One patient presented following motor vehicle crash due to a witnessed cardiac arrest. The patient regained perfusion through cardiopulmonary resuscitation in the field, but arrived hypotensive in cardiogenic shock. No traumatic injuries were found. REBOA was performed with improvement in cardiac perfusion resulting in patient survival and discharge home.

Conclusion: While REBOA was originally intended for control of traumatic hemorrhage, we have successfully used REBOA for several non-trauma indications with similar patient survival. Trauma surgeons who perform REBOA can be a valuable resource to both elective and emergent non-trauma surgical patients.

Session VIII: WTC I Session: Emergency General Surgery
Paper 4: 6:15am - 7:15am

DAMAGE CONTROL OR DEFINITIVE REPAIR? A RETROSPECTIVE AUDIT OF ABDOMINAL TRAUMA AT A SOUTH AFRICAN CENTRE.

Ross D. Weale MBBS, BSc, Victor Kong Ph.D., MBChB, Johan Buitendag MBChB, Joanna Blodgett BSc, Damian L. Clarke Ph.D., MBChB Pietermaritzburg Metropolitan Trauma Service, Department Of Surgery

Introduction: The indications for damage control surgery (DCS) rely heavily on clinical judgement. This audit set out to assess and compare the presenting physiology and organ injury pattern of the DCS patient vs the non-DCS patient and to use this data to assess if any of four clinical prediction scores, namely PATI (penetrating abdominal trauma index), ISS (injury severity score), AIS-abdomen (abbreviated injury scale-abdomen) and AIS-chest, are predictive of the need for DCS.

Methods: All patients undergoing a laparotomy for trauma over the period from December 2012 to December 2017 at a Major Trauma Centre in South Africa were retrieved from the regional database. Statistical analysis was performed using STATA 15.0 ©.

Results: A total of 562 patients were included in this analysis, all of which underwent trauma laparotomy. 99 of these (18%) had a DCS procedure vs 463 (82%) non-DCS. In a multiple logistic regression model, the only predictive scoring system significantly associated with the need for DCS was the PATI score (p 0.044). Neither ISS (p 0.293), AIS-abdomen (p 0.194) nor AIS-chest (p 0.325) were statistically significant. A multiple logistic regression model revealed a significant association with SBP <90 mmHg (systolic blood pressure) (p 0.005), pH <7.2 (p 0.001), PATI score (p 0.019) and liver injury (p 0.004). Pancreatic-duodenal injury (p 0.586) and IAVI (p 0.156) were not significant in this model in their prediction for DCS.

Conclusion: This comprehensive analysis proves that even aggregate anatomical scores are not nearly as predictive as physiology when considering the need for DCS. This is in keeping with the central tenet of damage control surgery, which focuses on the correction of *physiological* rather than *anatomic* status.

Session VIII: WTC I Session: Emergency General Surgery
Paper 5: 6:15am - 7:15am

A CHANCE TO CUT: DEFINING A NEGATIVE EXPLORATION RATE IN PATIENTS WITH SUSPECTED NECROTIZING SOFT TISSUE INFECTION

Erin C. Howell MD, Jessica A. Keeley MD, Amy H. Kaji MD,Ph.D., Molly R. Deane MD, Dennis Y. Kim* MD, Brant Putnam* MD, Steven L. Lee MD, Alexis L. Woods BA, Angela L. Neville* MD, Harbor-UCLA Medical Center

Introduction: Multiple predictive models exist for the identification of necrotizing soft tissue infection (NSTI), yet a subset of patients will not have NSTI at exploration. We hypothesize non-NSTI patients are clinically similar to those patients that have an NSTI and seek to report a rate of negative exploration for this disease process.

Methods: We conducted a retrospective review of patients (n= 295) undergoing surgery for suspected NSTI at our county funded, academic medical center between 2008-2015. Patients with NSTI identified surgically were compared to patients with negative explorations.

Results: Over the 7-year study period, 232 (79%) patients were diagnosed with an NSTI at the initial surgery and 63 (21%) were not. Of these 63 patients, 5 (7.9%) had an abscess and 58 (92%) had cellulitis resulting in a total of 237 (80%) patients with a surgical disease process. NSTI patients had higher white blood cell count and blood glucose levels, but were less likely to have violaceous skin changes. Other presenting clinical variables were similar between patients with and without NSTI (Table). Eight (14%) patients initially diagnosed with cellulitis had an NSTI diagnosed upon return to the operating room for failure to improve.

	NSTI, n = 232	Non-NSTI, n=63	p-value
Temperature	98.9, 98.1-100.5	99.1, 98.5-100.6	0.2
Heart Rate	101, 91-115	100, 88-109	0.3
Violaceous Skin	9.2%	23.8%	0.004
WBC	18.5, 13.5-24.4	14.9, 11.9-22.7	0.02
Band Forms	16.5, 9.0-30.0	17.5, 12.0-26.0	0.7
Lactate	1.7, 1.3-2.6	1.8, 1.3-2.3	0.6
Creatinine	1.2, 0.9-1.8	1.3, 0.9-2.0	0.6
Glucose	244, 131-393	114, 102-136	<0.0001
Corrected Na	134, 131-137	134, 132-137	0.7

Median values with IQR unless otherwise specified

Conclusion: Given the known implications of delayed surgical management, we propose a 20% negative exploration rate for suspected NSTI. Ongoing vigilance of this cohort is warranted as a small subset may progress.

4:45-5:45 pm

Session XVI: WTC II Sessions

WTC 8: Research **Sponsored by European Society for Trauma and Emergency Surgery (ESTES)**

Location: **Seaport A-C, Second Level (Seaport Tower)**

Moderators: Ronald Maier, MD and Ingo Marzi, MD, USA and Germany
Keynote: Bertil Bouillon, MD, Influence of Trauma Registry Data on Basic Research

A COMPARISON OF TRAUMA OUTCOMES BETWEEN JAPAN AND UNITED STATES USING NATIONAL TRAUMA REGISTRIES
Presenter: Shokei Matsumoto, MD, Japan

THE IMPACT OF GEOCODING A TRAUMA REGISTRY
Presenter: Ben Gardiner, RN, BN, GDip Periop, Australia

CAUSES AND OUTCOMES OF UNINTENTIONAL AND INTENTIONAL TRAUMATIC BRAIN INJURIES IN UGANDA: ANALYSIS FROM HOSPITAL-BASED REGISTRY
Presenter: Nukhba Zia, MD, MPH, USA/Uganda

REJUVENATION OF AGED BONE MARROW STEM CELLS TO IMPROVE THE POTENTIAL OF OSTEOGENIC DIFFERENTIATION BY MICROENVIRONENTAL REGULATION
Presenter: Yu Pan, MD, BS, China

DECREASED LEUKOCYTE VIABILITY IN SURGICAL PATIENTS: A NEWLY DESCRIBED PHENOMENON
Presenter: Lillian Hesselink, MD, Netherlands

Session XVI: WTC II Session: Research
Paper 1: 4:45pm - 5:45pm

A comparison of trauma outcomes between Japan and United States using national trauma registries.

Shokei Matsumoto MD, Kyoungwon Jung MD, Alan Smith Ph.D., Motoyasu Yamazaki MD, Mitsuhide Kitano MD, Raul Coimbra MD,Ph.D., Saiseikai Yokohamashi Tobu Hospital

Introduction: Japan has recently made concerted efforts to improve trauma outcomes over the last decade. The United State (US) has developed advanced regional trauma systems in the last four decades. The National Trauma Data Bank (NTDB)should serve as a benchmark of quality of care and outcomes for international trauma registries. Here, we compared patient characteristics, trauma management, and outcomes in Japan using the Japanese Trauma Data Bank (JTDB) dataset to US level 1 trauma centers using the NTDB dataset.

Method: A retrospective cohort matching study was performed to compare trauma outcomes between the JTDB and the NTDB in order to evaluate Japanese trauma quality using NTDB as a benchmark. Patients aged ≥16 years old, with Injury Severity Score (ISS) ≥9, treated at level I trauma centers in 2013 were included in the analysis. Patients who were dead on arrival or with gunshot wounds, were excluded. The primary outcome measure was in-hospital mortality. Secondary outcome measures included hospital length of stay (LOS) and the rate of use of radiologic diagnostic modalities. A 1:1 matching strategy was used.

Results: During the study period, 22,535 patients in the JTDB and 112,060 patients in the NTDB were eligible for inclusion in this study. Using one to one exact matching, 14,960 pairs were generated. Significant differences were found between the two cohorts; in particular, the JTDB group had a higher rate of elderly patients and self-inflicted wounds. After 1:1 matching, patient characteristics were well balanced in both the groups. Before matching, the in-hospital mortality was higher in the JTDB group compared to the NTDB group (7.6% vs. 6.1%; Odds ratio (OR), 1.28; 95% CI: 1.21-1.35). However, after matching, in-hospital mortality was lower in the JTDB (4.2% vs. 5.8%; OR, 0.72; 95%CI: 0.65-0.80) (Fig. 1). After matching, the median hospital LOS was more than three times higher in the JTDB group than in the NTDB (17.0 [7.0-32.0] vs. 5.0 [3.0-8.0], $P < 0.001$). CT scans were used in more than 80% patients in the JTDB and more than 1.5 times as often in the JTDB than in the NTDB (Fig. 2).

Conclusion: We reported marked differences of trauma care between Japan and the US. However, the quality of the recent Japanese trauma care appears to be approaching that of the US. These comparisons may contribute to further improvements in Japanese trauma care.

Fig. 1 In-hospital mortality

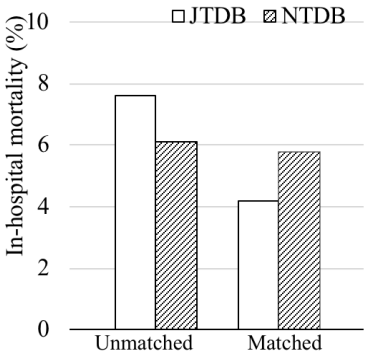
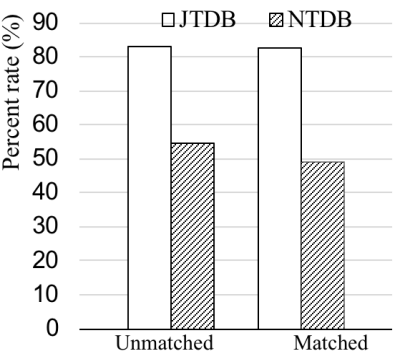


Fig. 2 The use of CT scans



Session XVI: WTC II Session: Research
Paper 2: 4:45pm - 5:45pm

THE IMPACT OF GEOCODING A TRAUMA REGISTRY.

Ben Gardiner RN, BN, GDip Periop., Pheobe Brandis MD, Caitlin O'Hare MD, Don Campbell MBBS, FACEM, Martin Wullschleger MD,Ph.D., FRACS. Gold Coast University Hospital

Introduction: Within the current Trauma landscape, injury location by zip/postal code is a mandated field within trauma registries such as the American National Trauma Data Standard and the Australian Trauma Registry. Postal codes in Australia do not have a defined geographic boundaries, these codes are for postal distribution system and are not related to specific address. Geocoding in population health epidemiological studies is common practice, although within trauma this has been isolated to only a few studies, focusing on planning and design of trauma systems. The Midlands Registry (New Zealand) has demonstrated the potential benefits of geocoding in trauma registries identifying 'hot-spots' and engaging with local communities for injury prevention. The aim of this study is to establish the viability of collating geocode of injury in a consistent methodology and examine the difference between retrospective and prospective collection practices.

Methods: Upon ethics approval, Gold Coast University Hospital Trauma Service undertook a retrospective spatial review of 927 incidents ISS>12 (AIS2005(08)), examining medical records and emergency medical services (EMS) records for 38 months (Jan 2014 - Feb 2017) for identifiers of specific injury location, then using a standardised Global Positioning System (GPS) address locator and collated the information within the trauma registry. For 9 months (Mar – Dec 2017) geocoded injury location has been collected from all trauma service patients at the bedside, where they had a presentation time to discharge >12hours. Analysis of the information was extracted from our trauma registry (Imagetrend®) utilising Tableau® and Qlik Sence® for spatial visualisation. Statistical significance was calculated on injury severity to ensure both groups collected were consistent.

Results: Retrospective GPS was collected on n=647/927 (69.8%) with an average ISS=21.41. The remaining retrospective non GPS group of 310 with an average ISS=23.07. The prospective (n=572) group was split for comparison into two groups where ISS>12 (same as retrospective group) this group achieved geocode collection n=180/232 with (77.6%) an average ISS=21.10. No significance between the groups in the Injury Severity Score was demonstrated ($p<0.01$). Early results of prospective collection identified a significant increase in data capture >80% for ISS>12, this result decreased in the latter part of the year with a change in EMS records. The remaining group collected prospectively (admission >12 hrs where ISS<13) n=392 had an average ISS=5.06. This showed we were collecting prospectively injury locations (68%) that were not achieving ISS>12.

Conclusion: We have demonstrated that injury geocode location is feasible, with prospective collection demonstrating improved collection methodology. The source of location derivation and quality of location information vary and impact on the interpretation of the spatial analysis. The improved geocoded locations have improved the specificity and heat analysis. The this study has informed our understanding of traumatic injury eg mortality due to traumatic brain injury and insights into paediatric trauma due to recreational activities. Geocoding is the key in the development of partnerships with government and community agencies for trauma prevention.

Session XVI: WTC II Session: Research
Paper 3: 4:45pm - 5:45pm

CAUSES AND OUTCOMES OF UNINTENTIONAL AND INTENTIONAL TRAUMATIC BRAIN INJURIES IN UGANDA: ANALYSIS FROM HOSPITAL-BASED REGISTRY

Nukhba Zia MD,MPH, Amber Mehmood MPH, Rukia Namaganda MPH, Hussein Ssenyonjo Joel Kiryabwire John Mukasa Michael Muhumuza Olive Kobusingye Adnan A. Hyder Ph.D., Johns Hopkins Bloomberg School Of Public Health, USA; Makerere University School Of Public Health And Mulago Hospital, Uganda

Introduction: Traumatic brain injury (TBI) is an important cause of morbidity and mortality especially in low-and-middle income countries. The objective was to assess causes and outcomes of unintentional and intentional TBI among patients presenting to a tertiary-care hospital in Uganda.

Methods: This prospective observational study was conducted at Mulago National Referral Hospital, Kampala, Uganda for 15-months in 2016-17. Patients of all age groups, males and females, presenting to the emergency department of the hospital with suspected or documented TBI were enrolled. Patient demographics, TBI causes and outcomes were recorded. TBI was grouped into mild, moderate and severe categories based on Glasgow Coma Scale (GCS). The outcome of interest was unintentional and intentional TBI. Ethical approval was taken from Johns Hopkins School of Public Health and Makerere University School of Public Health.

Results: Total 3944 patients were enrolled, of these 66.2% were unintentional TBI and 30% were intentional TBI. The average age of patients in both groups was similar (28±14 years) with over 70% patients between 19–45 years age group. More than 80% were males in both groups. The main causes of unintentional TBI were road traffic injuries (RTIs) (89%) and falls (11%). Pedestrians (42.3%) and motorcycle drivers (28.1%) were common road users. Only 16% of RTI patients were wearing helmet at the time of the crash. Assault (97.1%) was the main cause of intentional TBI, however, there were 33 (2.9%) self-harm cases. Common assault methods were use of bodily force (33.7%), iron bar (24.2%) and hammer (12%). Gun was used in 3 cases. Around 16.5% of RTI patients and 23.3% of fall patients had GCS below 8. TBI patients with self-harm were likely to be in severe GCS category (39.4%) compare to victims of assault (14%). Among unintentional TBI patients, about 40.6% of the patients were admitted to ward, 32.8%were sent home. There were 73 deaths; 63 were RTI patients and 10 had a fall. Among intentional TBI patients, 42.6% of the patients were admitted for inpatient care and 42.6% were sent home. There were 30 deaths; 29 were assault victims and 1 of self-harm.

Conclusion: Unintentional TBI caused by RTI and intentional TBI caused by assault are common among young males in Kampala. This has consequences for Uganda which has a young population contributing to a broad population pyramid. Most young males are vulnerable road users including pedestrians and motorcycle riders. Having designated pedestrian crossing for pedestrians and mandatory helmet use can reduce TBI caused by RTIs. There is need for further exploration of intentional injuries among youth in the country and to develop programs to engage youth in productive activities for contribution towards country's economic development.

Session XVI: WTC II Session: Research
Paper 4: 4:45pm - 5:45pm

REJUVENATION OF AGED BONE MARROW STEM CELLS TO IMPROVE THE POTENTIAL OF OSTEOGENIC DIFFERENTIATION BY MICROENVIRONENTAL REGULATION

Yu PAN BS,MD, Sa CAI MD, Xiao-Ming WU BS, Master of Surgery Bao-An People's Hospital, Affiliated To Southern Medical University & Guangdong Medical Univeristy

Introduction: The accumulation of aged adult stem cells and attenuation of tissue repair capacity characterize the aging process of the body. The microenvironment of aged cells is defined as senescent associated secretory phenotype (SASP), which might stress adjacent stem cells to age and jeopardize the homeostasis of tissue repair. We tried to find the key secretory factors to intervene the senescent microenvironment and rejuvenate the aged stem cells.

Methods: The aged bone marrow stem cells (BMMSCs) were obtained from osteoporotic patients over 65 years old, and young stem cells 20-35 years old health donors. The extraction from the culture medium of young cells were collected and add to the culture medium of aged cells. Then we detected the effects on cell proliferation, cellular senescent protein markers and oxidative responses to assess the rejuvenation of the aged cells. We also observed the change of potential of osteogenic differentiation after the treatment. The young cells-derived exosome was also collected to observe its effects on the biological functions of aged stem cells.

Results: The senescent phenotype of aged BMMSCs were reversed by the treatment of young culture medium and exosome, demonstrated by the down-regulation of cellular senescent markers including: SA-b-Gal activity, p16 and p53. The declined cell proliferation of aged BMMSCs was also rescued by the secretory factors of young cells. Similar results on the osteogenic differentiation induction assay also suggested the function of BMMSCs increased after the young secretory factors treatment.

Conclusion: The microenvironment of aged stem cells is characterized by their secretory factors, which are crucial to the cellular functions of BMMSCs. Rejuvenation the aged stem cells with secretory factors provide a promising way to resist the functional attenuation of stem cells.

Session XVI: WTC II Session: Research
Paper 5: 4:45pm - 5:45pm

DECREASED LEUKOCYTE VIABILITY IN SURGICAL PATIENTS: A NEWLY DESCRIBED PHENOMENON.

Lillian Hesselink MD, Albert Huisman Ph.D., PharmD, Imo Hoefer Ph.D., Maarten Ten Berg Ph.D., Leo Koenderman Ph.D., Luke P. Leenen MD,Ph.D., FACS, FEBS (Emerg Surg), Falco Hietbrink MD,Ph.D., University Medical Center Utrecht

Introduction: Non-viable leukocytes were incidentally found in critically ill patients after trauma. Not much is known about this phenomenon and its implications for leukocyte functioning. The aim of this study was to investigate the incidence of a decreased leukocyte viability in surgical patients and reveal the mechanisms behind this decreased leukocyte viability.

Methods: Leukocyte viability was routinely measured in every blood analysis with propidium iodide staining and was stored in the hospital database. Propidium iodide stains DNA of non-viable leukocytes. The incidence of a decreased leukocyte viability among surgical patients and trauma patients was investigated. Then, the propidium iodide signal that indicated decreased leukocyte viability, was investigated. Based on distinct propidium iodide signals, underlying mechanisms for a decreased leukocyte viability were simulated *in vitro.* A prospective analysis was carried out in surgical patients with a leukocyte viability ≤ 95%. The analysis included reassessing leukocyte viability, measuring leukocyte receptor expression and investigating leukocyte functioning (phagocytosis and responsiveness to a bacterial stimulus).

Results: Decreased leukocyte viability was found in 3% of all surgical patients. The propidium iodide signal in patients with decreased leukocyte viability (n = 10) was suggestive for non-viable leukocytes in half of the patients and adherence of DNA to leukocytes in the other half. Both adherence of DNA and non-viable leukocytes could be simulated *in vitro.* Next, nine surgical patients were prospectively included. All 9 patients had a diagnosed or suspected infection. Analysis of all patients showed the presence of leukocytes with low viability characterized by either increased leukocyte autofluorescence (n = 6) or by the presence of fragile circulating leukocytes (n = 3). Fragile leukocytes were leukocytes that became non-viable when kept in certain tubes (such as EDTA) or after *ex vivo* manipulation (such as red blood cell lysis).

Conclusion: A decreased leukocyte viability in surgical patients such as measured by routine hematological analyzers, reflects either fragile circulating leukocytes or leukocyte autofluorescence. Further analyses will be performed to get better insight in leukocyte functioning in these patients and to get a better understanding of how these data can be used in clinical practice.

WTC 9: Shock/Transfusion **Sponsored by The Japanese Society for Acute Care Surgery (JSACS)**

Location: Coronado A, Fourth Level (Harbor Tower)

Moderator: Ernest E. Moore, MD and Yasuhiro Otomo, MD, PhD, USA and Japan
Keynote: Yasuhiro Otomo, MD, PhD, Traumatic Coagulopathy

ONE HUNDRED PERCENTS FATALITY RATE IN ASIANS WITH HYPERFIBRINOLYSIS AFTER MAJOR TRAUMA: A REPORT FROM A LEVEL I TRAUMA CENTER IN ASIA CALLING FOR AN EARLY AGGRESSIVE APPROACH
Presenter: Burapat Sangthong, MD, Thailand

CLINICAL EVALUATION OF A NOVEL COAGULOPATHY DEVICE
Presenter: Emily Ashworth, RN BNurs (hons) Mres, England

TEG IN TRAUMA PATIENTS: EVERY MINUTE COUNTS
Presenter: Alison Smith, MD, PhD, USA

EVALUATION OF FACTORS AFFECTING CLINICAL OUTCOMES IN PATIENTS WITH PENETRATING CARDIAC INJURIES BY CORTOPUNZANTE WEAPON. 5 YEARS EXPERIENCE IN A LEVEL 1 COMPLEXITY INSTITUTION IN COLOMBIA
Presenter: Oscar Dussan, MD, Colombia

MASS-CASUALTY IN A LEVEL 2 TRAUMA CENTER: ARE WE REALLY PREPARED?
Presenter: Morgan Pomeranz, MD, USA

Session XVI: WTC II Session: Shock/Transfusion
Paper 1: 4:45pm - 5:45pm

ONE HUNDRED PERCENTS FATALITY RATE IN ASIANS WITH HYPERFIBRINOLYSIS AFTER MAJOR TRAUMA: A REPORT FROM A LEVEL I TRAUMA CENTER IN ASIA CALLING FOR AN EARLY AGGRESSIVE APPROACH.

Burapat Sangthong MD, Chomphunut Supavita MD, Osaree Akaraborworn MD, MS, Komet Thongkhao MD,Khanitta Kaewsaengrueang BS, Prattana Chainiramol RN, Prince Of Songkla University

Introduction: Hemorrhage remains the leading cause of death after trauma worldwide. Coagulopathy after severe hemorrahge is common and leads to complicated bleeding control which increases mortality and blood transfusions. Recent studies from Western countries have identified the coagulopathy is associated with hyperfibrinolysis (HF). This study was designed to determine the incidence of HF after trauma in an Asian population and its outcomes.

Methods: A case-control study was conducted. All adult trauma patients presented directly to our institution, a level I trauma center in Thailand, and met major trauma activation criteria were reviewed. Patients who were transferred and resusciated from outside hospitals were excluded from the study. Blood for coagulation studies was drawn on arrival. HF was determined by rotational thromboelastrometry (ROTEM), a viscoelastic hemostatic test. The patient characteristics, transfusion requirements, and mortality were reviewed.

Results: During the two-year study period, a total of 2,368 adult trauma patients were admitted with 353 patients met severe trauma activation criteria. Forty-three patients had full data sets of ROTEM and were the study population. The average age was 36.0 $\pm$14.0 years old. Forty-one (95.4%) of the patients were male. The median Injury Severity Score was 25 (14-33). Blunt trauma was the majority of injury mechanism (79.1%). HF was identified in two patients (4.7%). The overall mortality rate was 32.6%. One hundred percent mortality rate was observed in the HF group while the group that did not exhibit HF on arrival (non-HF group) showed 29.3%mortality rate. Blood product requirements and mortality rate between the 2 groups was shown (Table 1).

Table 1. Blood product requirements and mortality rate between HF group and non-HF group

Blood product	HF group (n=2)	Non-HF group (n=41)
Packed red cells (units)	13.0$\pm$7.0	5.5$\pm$7.4
Fresh frozen plasma (mL)	2,046.5$\pm$1,116.5	1,269.4$\pm$1,819.4
Platelet concentration (units)	11.0$\pm$15.6	3.5$\pm$6.5
Mortality rate (%)	100.0	29.3

Conclusion: Hyperfibrinolysis rarely occurred in Asian population with severe trauma. However, patients that exhibited hyperfibrinolysis have extremely high mortality rate and need massive amount of blood transfusion. Further study to address this coagulation disturbance is substantially warranted.

Session XVI: WTC II Session: Shock/Transfusion
Paper 2: 4:45pm - 5:45pm

CLINICAL EVALUATION OF A NOVEL COAGULOPATHY DEVICE

Emily R. Ashworth RN BNurs (hons) MRes, Mansoor Khan MBBS (Lond) PhD FRCS FEBS FACS Imperial College London

Introduction: Thrombelastography (TEG) provides viscoelastic information on the clotting processes in real-time. It is currently applied in trauma patients who are at risk of bleeding or who are being transferred to theatres when it is vital to analyse and understand their coagulopathy. Trauma patients, in particular, are at risk of changes to coagulopathy due to massive haemorrhage, body temperature and infusion of blood products. TEG analysis is not a substitute for ANTT and INR measurements, but the analysis time is considerably quicker than comparable laboratory tests and does provide guidance and information pre-transfusion in "at risk" patients. Current TEG instruments are large and relatively immobile but the data the technique provides, is useful in early-trauma resuscitation and providing information on coagulation pathways in bleeding trauma patients. We tested a novel portable viscoelastic measuring device (CoaguScan Biosensor) and compared it to a Haemonetics TEG 5000 analyser.

Methods: 20 Consecutive trauma patients were selected (convenience sampling) based upon their suitability to need a TEG. A routine TEG was taken for patient care, and the remained of this sample that would normally go to waste was used for the CoaguScan Biosensor. All adult trauma patients were included (age 18 and above), and patients were recruited using a nominated consultee if unable to consent at the time of the study. These results were anonymised prior to data analysis and 12 healthy volunteers were used as a comparator. Clinicians requesting the TEG were blinded to the Biosensor results.

Results: Results compared were: initial viscosity, blood viscosity, maximum amplitude, R-time (time to detect the clot), and overall raw traces. The CoaguScan Biosensor showed comparable results to that of the TEG 5000, despite the biosensor being an early pre-production model. The positive correlation potentially demonstrates that the Biosensor may be used to measure and observe coagulopathy, and that this could be calibrated to the results of the TEG for Clinicians to direct care. The Biosensor showed a significant difference in Maximum Amplitude – giving an indication that the biosensor may be more sensitive to this measurement than the TEG 5000. It also identified a hyperfibrinolysis in trauma patients where the TEG 5000 stated there was normal, suggesting potential for detecting Acute Coagulopathy of Trauma. Comparison against the TEG 5000 was challenging as the biosensor was configured to mimic the manual steps associated with the TEG, but the biosensor had a much smaller sample size. This study was limited by a small sample size and a device that is in early stages of development and therefore more prone to user error.

Conclusion: Further work validation and calibrating the device on both healthy volunteers and abnormal samples is currently being undertaken to further understand the results produced and to show comparability to the current TEG and ROTEM devices. Following calibration, a large multi-centre study, taking samples from trauma patients at point of injury and throughout the patient pathway will be completed. The benefit of a portable device, with rapid diagnosis of coagulopathy in trauma – particularly early on the in the patient pathway is currently unknown – a device such as this indicate on how to direct care using early coagulopathy results.

Session XVI: WTC II Session: Shock/Transfusion
Paper 3: 4:45pm - 5:45pm

TEG IN TRAUMA PATIENTS: EVERY MINUTE COUNTS

Alison A. Smith MD,Ph.D., Lynn Hakki BS, Matthew Marturano BS, Chrissy Guidry DO, Patrick McGrew MD, Clifton McGinness MD, Rebecca Schroll MD, Juan Duchesne MD, Tulane School of Medicine

Introduction: Thromboelastography **(**TEG) has become an integral part of the management of trauma patients. However, optimal protocols to incorporate TEG into routine trauma protocols have not been determined. We hypothesize a correlation between early TEG use and survival in patients with severe hemorrhage.

Methods: A retrospective review of consecutive adult patients who received massive transfusion protocol (MTP) at a Level I Trauma Center was performed from 4/2017-2/2018. Patient demographics, Injury Severity Score (ISS), blood product usage, and mortality were recorded. Patients were stratified into 2 groups based on length of time before TEG was ordered (TEG-L, $\geq$120 min and TEG-S$\leq$120 min). Patient outcomes were analyzed with a t test for univariate analysis.

Results: A total of 91 patients were identified and 56.0% of these patients had TEG level measured. Average time for trauma surgeons to order TEG was 381.4 min with a range of 22-7226 min. There was no difference in baseline patient demographics between TEG-L and TEG-S patients. The TEG-S group had decreased ICU LOS (8.6 $\pm$1.8 vs. 22.6$\pm$3.8, p=0.0031) and decreased deaths (14.2% vs 47.8%, p=0.0135).

Table 1. Demographics and outcomes for trauma patients with massive hemorrhage stratified by length of time for trauma surgeon to order TEG.

Variable	Short TEG N=23	Long TEG N=28	p value
Age, avg yrs (SEM)	38.0 (3.1)	34.0 (2.6)	0.32
Male gender, n (%)	20 (87.0)	19 (67.9)	0.18
Penetrating trauma, n (%)	15 (65.2)	17 (60.7)	0.78
ISS, avg (SEM)	25.5 (2.8)	20.0 (1.1)	0.06
ED SBP, avg (SEM)	113.7 (7.7)	104.9 (3.7)	0.28
GCS, avg (SEM)	8.9 (1.0)	11.0 (1.0)	0.15
Outcomes			
PRBCs in 24 hrs, avg (SEM)	16.8 (3.9)	12.7 (2.5)	0.22
FFP in 24 hrs, avg (SEM)	14.0 (3.2)	10.2 (2.1)	0.31
Platelets in 24 hrs, avg (SEM)	2.1 (0.1)	2.0 (0.3)	0.82
Crystalloids, avg (SEM)	2852.3 (386.0)	2840.0 (294.2)	1.0
Hospital LOS, avg (SEM)	16.4 (3.8)	22.6 (2.8)	0.19
ICU LOS, avg (SEM)	8.6 (1.8)	22.6 (3.8)	**0.0031**
Ventilator days, avg (SEM)	5.8 (1.3)	11.0 (2.3)	0.15
Death, n (%)	4 (14.2)	11 (47.8)	**0.0135**

Conclusion: This analysis demonstrated a survival benefit in severe hemorrhage patients with early use of TEG. Institutions should adopt quality measures to review proper early use of TEG in patients with severe hemorrhage. Prospective validation is needed in order to better understand this TEG time-survival correlation.

Session XVI: WTC II Session: Shock/Transfusion
Paper 4: 4:45pm - 5:45pm

Evaluation of Factors Affecting Clinical Outcomes in Patients with Penetrating Cardiac Injuries by Cortopunzante Weapon. 5 Years Experience in a Level 1 Complexity Institution in Colombia.

Oscar Dussan MD, Jose D. Charry MD, Roberto J. Rodriguez MD, Rafale Silva MD, Francisco Ruiz MD, Hospital Universitario De Neiva

Introduction: The behavior of assault injuries with a short stabbing weapon as a cause of death has been described from 1980 to 2016 by the Global Burden Of Disease with a sustained trend in young population between 15 to 55 years of age, with a peak persistent towards 25 years The injuries caused by sharps in the thorax are related to a high mortality despite the early interventions carried out by the pre-hospital care staff and even in the emergency room of hospitals around the world, despite the advances in the area of care in trauma, the implementation of programs such as ATLS and the use of portable ultrasound images, up to 90% of patients may die before reaching the emergency service. The objective of the following study was to describe the different factors that affect clinical outcomes in patients with wounds caused by a sharp weapon in the thorax.

Methods: Observational descriptive study of patients admitted to the emergency department with a diagnosis or penetrating cardiac lesion, clinical, paraclinical, imaging findings were evaluated, patients were lowered, central tendency measures were calculated, statistical confidence tests were applied as Chi2, wilconson test, fisher test.

Results: The majority of patients belong to the male sex 86%]; the average age was 30.6 ± 9.75 years, 98% of penetrating injuries were located within the area, At the time of admission to the emergency department, the average Systolic Blood Pressure (SBP) was 79.4 mmHg and the heart rate (HR) was 100 beats per minute; the average of the Shock Index (IS) was 1.9, Admission to the Intensive Care Unit was required by 21 (42%) of the patients and 36 (72%) required the use of Hemocomponents during the hospital stay. The average hospital stay was 7.5 ± 6.1 days. The location of the cardiac lesions were 60% of cases in the right ventricle, 18% in the left ventricle, 12% in the right atrium, 6% in the pericardial sac and 4% in the left atrium. The left anterolateral thoracotomy was the most frequent technique of surgical approach. The average size of the cardiac lesions was 19.2 mm. Hospital mortality was 14%. The diagnostic method of cardiac injury was by Surgery in 62%.

Conclusion:Despite advances in pre-hospital care, diagnostic modalities and resuscitation strategies, PCLs remain highly lethal. A clinical suspicion focused on the early recognition of the unstable patient with lesion in the precordial area allows decision-making aimed at imaging diagnosis or immediate surgical diagnosis.

Session XVI: WTC II Session: Shock/Transfusion
Paper 5: 4:45pm - 5:45pm

MASS-CASUALTY IN A LEVEL 2 TRAUMA CENTER: ARE WE REALLY PREPARED?

Morgan Pomeranz MD, Matthew Johnson MD, Sunrise Hospital And Medical Center

Introduction: On the 1st of October, 2017 in Las Vegas, Nevada, a crowd of over 22,000 people at a country music festival was fired upon by an individual using a semi-automatic converted to automatic rifle from an elevated position at the Mandalay Bay Hotel and Casino. This resulted in approximately 60 fatalities and over 500 injuries. The majority of those who were injured were treated at one of two major trauma centers in the city.

Methods and Results: Sunrise Hospital and Medical Center received and treated 221 of those patients. Of those, 16 were triaged to category black and later pronounced deceased, over 95 underwent surgery in the first 24 hours, and an unknown number were treated for minor injuries and left the hospital without being registered. Through the combined efforts of the trauma surgeons, residents, and registered nurses, non-trauma surgeons, anesthesiologists and nurse anesthetists, physician assistants, nurse practitioners, and support staff of all levels, the above was accomplished and with only two additional mortalities occurring after the first 24 hours.

Conclusion: Routine training for mass casualty incidents (MCI) and other disasters is part of the curriculum for most trauma centers. However, no amount of preparation would be considered adequate for one of such a large scale as that which occurred on October 1st. Sunrise Hospital periodically performs mock trauma scenarios in order to keep its staff ready in the event of such situations, but these are usually limited to motor vehicle collisions and associated blunt trauma. Those performing their duties during the MCI at Sunrise will attest that the patients were treated properly with remarkable speed and efficiency, and although strained for personnel and resources at times, the compensatory efforts made were successful. Part of this can be explained by the nature of the trauma seen in Las Vegas routinely. In 2017, there were 408 cases of penetrating trauma treated at Sunrise Hospital, including 316 caused by firearms. These numbers and experience translate into familiarity, comfort, and skill in treating this type of pathology that would make the outcomes and statistics of this MCI otherwise unachievable. There is a wide variation in the types of trauma that are seen at different trauma centers across the United States, with many seeing blunt trauma disproportionately. Many surgical residency programs send their trainees to larger academic centers in order to fulfill their trauma training requirements and gain a more broad perspective in the field. In light of recent events and the realization of certain deficiencies, it would be of great benefit to expand on this concept, and examine the possibility of developing further cross-program integration or exchanges for MCI routine training and continuing medical education for all trauma healthcare providers. This would create a network of well-prepared community trauma centers, better prepared to serve their regions and alleviate a portion of burden on the more high-volume academic centers.

WTC 10: Prevention/Outcomes **Sponsored by SBAIT - Brazilian Trauma Society**

Location: Harbor B, Fourth Level (Harbor Tower)

Moderators: Rochelle Dicker, MD and Gustavo Fraga, MD, PhD, USA and Brazil
Keynote: Gustavo Fraga, MD, PhD, "Yellow May" - Trauma Prevention Program

EDUCATION IN TRAUMA: AN EDUCATIONAL ALTERNATIVE THAT PROMOTES INJURY PREVENTION
Presenter: Jose Charry, MD, PhD, Colombia

PSYCHOLOGICAL DISTRESS AFTER TRAUMA: A PROSPECTIVE COHORT STUDY
Presenter: Leonie De Munter, MSc, Netherlands

EFFECTS OF TRAUMA CENTER ON MORTALITY AT A REGIONAL CITY IN JAPAN: A POPULATION BASED STUDY
Presenter: Yuji Takahashi, MD, Japan

PSYCHOLOGICAL DEVELOPMENTS 28 YEARS AFTER MULTIPLE TRAUMA
Presenter: Sascha Halvachizadeh, MD, Switzerland

TRAUMA, TREATMENT AND REHABILITATION: A PATIENTS' PERSPECTIVE
Presenter: Eva Visser, MSc, Netherlands

Session XVI: WTC II Session: Prevention/Outcomes
Paper 1: 4:45pm - 5:45pm

Education in trauma: An educational alternative that promotes injury prevention.

Jose D. Charry MD,Ph.D., Sandra L. Navarro-Parra Ph.D., FUNDACIÓN UNIVERSITARIA NAVARRA

Introduction: As trauma is a public health problem, different programs have been designed to prevent injuries. The aim of this study was to evaluate the effectiveness of an educational model that measures the adolescents' attitudes towards the rules of road safety, alcohol and road accidents in Colombia.

Methods: A pedagogical model evaluating the effect of road safety education and adolescents' attitudes towards and experiences of alcohol and road accidents in Colombia was created. After the education concluded, this educational process is analyzed by its impact on adolescents' behavior. The educational program included 160 adolescents with the mean age being 17.5 years.

Results: The test results indicated that before the educational program 80% of adolescents did not use a safety element when driving, while after the educational program the percentage of no helmet use among adolescents decreased from 72.5% to 24.3% ($p = 0.0001$) and driving a vehicle under the state of drunkenness from 49.3% to 8.1% ($p = 0.0001$).

Conclusion: An educational model aimed at preventing injuries caused by traffic accidents is shown to be effective in generating changes in adolescents' customs of and attitudes towards alcohol and road safety standards in Colombia

Session XVI: WTC II Session: Prevention/Outcomes
Paper 2: 4:45pm - 5:45pm

PSYCHOLOGICAL DISTRESS AFTER TRAUMA: A PROSPECTIVE COHORT STUDY

Leonie De Munter MSc, Suzanne Polinder Ph.D., Cornelis L. Van De Ree MD, Nena Kruithof MSc, Juanita A. Haagsma Ph.D., Mariska A. De Jongh Ph.D., Elisabeth-Twee Steden Hospital

Introduction: Psychological distress is a general term to describe a state of emotional suffering that interferes with the level of functioning, and could be characterized by symptoms of posttraumatic stress (PTSS), and symptoms of depression and anxiety. This study aimed to (1) describe the prevalence of psychological distress within one year after injury in a clinical trauma population (2) determine risk factors for this poor outcome and (3) develop prediction models for poor psychological outcome 6 months and 1 year after trauma.

Methods: This is a multicenter prospective observational cohort study. All adult trauma patients admitted to ten hospitals (N=9774) were asked to complete a questionnaire at 1 week, and 1, 3, 6 and 12 months after injury. The Hospital Anxiety and Depression Scale (HADS) was used to screen for anxiety and depressive disorders and the Impact of Event Scale (IES) was used to assess symptoms of posttraumatic stress disorder (PTSD). Potential predictors were assessed in univariable logistic regression, with psychological distress as outcome. Psychological distress was defined as: HADS≥8 or IES≥35. All risk factors with a $p<0.2$ were included in multivariable model. The model performances were assessed with the discrimination (Area Under the Curve), Nagelkerke R-square (R^2) and graphically with calibration curves.

Results: A total of 4883 patients (46%) completed at least one questionnaire in the follow-up period of one year after trauma. Prevalence rates of psychological distress is higher in women than in men. Patients with a low injury severity score also suffered from psychological distress. Overall, the prevalence of anxiety and depressive symptoms decreased during the follow up period. The highest prevalence of PTSS was found in female trauma patients with low injury severity. Risk factors for poor psychological outcome are female gender, low educational level, low injury severity, pre injury presence of anxiety and depression, and low functional capacity index.

Conclusion: Prevalence of psychological distress is high among female trauma survivors. This study provides possible tools for early diagnosis and screening of poor psychological outcome after trauma. Further research is needed to externally validate these findings.

Session XVI: WTC II Session: Prevention/Outcomes
Paper 3: 4:45pm - 5:45pm

EFFECTS OF TRAUMA CENTER ON MORTALITY AT A REGIONAL CITY IN JAPAN: A POPULATION BASED STUDY

Yuji Takahashi MD, Kazunori Yamashita MD,Ph.D., Naoya Matsumoto MD,Ph.D., Yoshihiro Nozaki MD,Ph.D., Tomohito Hirao MD,Ph.D., Goro Tajima MD,Ph.D., Takamitsu Inokuma MD,Ph.D., Shuhei Yamano MD, Kensuke Takahashi MD,Ph.D., Takashi Miyamoto MD,Ph.D., Kenichiro Inoue MD, Department Of Emergency Medicine, Unit Of Clinical Medicine, Nagasaki University Graduate School Of Biomedical Sciences

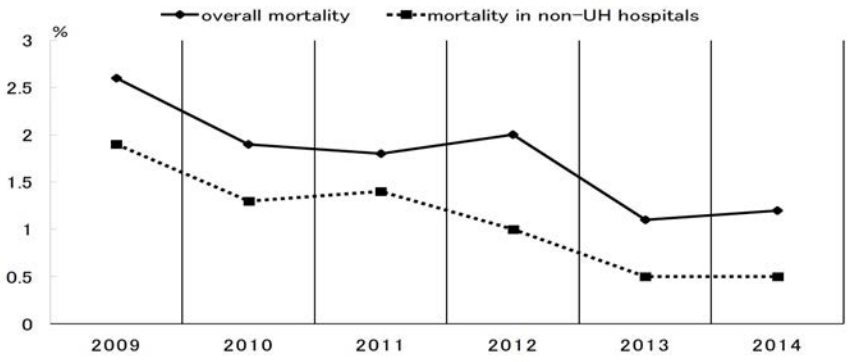
Introduction: Although trauma centers have been reported to be effective on mortality of trauma patients, their effects on mortality in a region have not been thoroughly investigated. In our medical district (about 500,000 of population), emergency medical center (EMC) and trauma center (TC) was established for the first time in April 2010, and October 2011 respectively in only one university hospital (UH), and cooperated with each other for trauma patients. The objective of this study is to clarify the effects of the centers on the mortality at a population-level.

Methods: Standardized regional data form were used for this retrospective study. The data have been collected for all patients taken to hospitals by ambulance, and included prehospital information, and both of diagnosis and outcome one week after injury. The analysis was performed during fiscal years from 2009 to 2014. Trauma patients were extracted from the codes of trauma such as “traumatic intracranial hemorrhage”, “spinal cord injury”, “cardiovascular and lung injury”, “abdominal organ injury”, “pelvic fracture”, “proximal femur fracture”, “severe multiple trauma”, and “other fractures”.

Results: There were total 122, 306 patients transported in the region during 6 years, and collection rate of the records was 92.6% (n=113,254). Out of them, 11,788 (10.4%) were trauma patients directly transported from the scene and used for analysis. Number of trauma patients, median a ge, and the time from call to hospital increased during the period(Table). Rate of patients transported to UH increased from 4.2% at 2009 to 7.5% at 2012 after establishment of trauma center. Mortality in UH decreased from 18.6% (2009) to 10.9% (2014), and that in non-UH hospitals also decreased from 1.9% to 0.5% (Figure). As a result, the overall mortality in the region improved from 2.6% to 1.2% despite of population aging and the increased time from call to hospital (Figure).

Fiscal year	2009	2010	2011	2012	2013	2014
All patients	18371	20199	20197	20895	21260	21384
Collection rate %(n)	90.8 (16679)	90.0 (18176)	91.7 (18529)	91.9 (19196)	95.2 (20241)	95.6 (20433)
Trauma patients	1992	2301	2302	2322	2557	2624
Direct transport	1658	1912	1851	1978	2163	2226
Age(median)	75	76	78	77	78	79
Call to hospital (median)	33.0	33.5	35.0	36.0	37.0	37.0

Conclusion: The establishment of EMC and TC resulted in the increase in a number of patients transported to UH, and the improvement of mortality at a population level. The centers may have contributed to trauma care in the region by intensification of severe trauma patients.



Session XVI: WTC II Session: Prevention/Outcomes
Paper 4: 4:45pm - 5:45pm

PSYCHOLOGICAL DEVELOPMENTS 28 YEARS AFTER MULTIPLE TRAUMA

Sascha Halvahizadeh MD, Henrik Teuber MD, Kai Sprengel MD, Georg Osterhoff MD, PD MD, Valentin Neuhaus MD, PD MD, Hans-Christoph Pape* MD, Prof. Dr. med., Roman Pfeifer MD, PD MD University Hospital Zurich

Introduction: The impact of polytrauma on long-term quality of life is poorly investigated. Potential effects are based on type and severity of the injury, but also on the psychological consequences of the trauma itself as well as long-term consequences. Trauma can decrease quality of life and increase socio-economic burden. We have previously shown long-term development of post-traumatic stress disorder and depression. In this study, we examined other long-term psychological developments in multiple injured patients.

Methods: More than 20 years after trauma, 637 patients enrolled in our polytrauma database who suffered trauma dating from January 1, 1973 to December 31, 1990 received a questionnaire that included self-assessment of posttraumatic psychological developments. This questionnaire included questions modified from or based on: Short Form 12 Health Survey (SF-12) Diagnostic criteria of PTSD from the Diagnostic and Statistical Manual of Mental Disorders (DSM IV) of the American Psychiatric Association (APA) HADS (Hospital Anxiety and Depression Scale) and the Clinical Anxiety Scale (CAS) as found in the Present State Examination (PSE, Wing, Cooper and Sartorius 1974) An internally devised question set to evaluate potential positive psychological developments

Inclusion criteria: patients who were enrolled in the database and returned the questionnaire.

Exclusion criteria: patients with severe head injuries or patients who could not fill out the questionnaire even with assistance.

Results: This study evaluated 337 completed questionnaires from 637 patients more than 20 years after trauma. Of these patients, 34.9% experienced or witnessed additional trauma, potentially amplifying psychological effects of the initial injury. Ten patients (3.0%) suffer from symptoms of PTSD. Further, 4.1% of patients reported symptoms of anxiety and nearly half (48.2%) show symptoms of depression. However, we also identified effects that were considered as positive by this population. The most common positive development was a sense of improved trust in others (42.0%) during times of need. Nearly one-third of patients (31.4%) accepted or learned to cope with personal shortcomings. More than half of patients (52.7%) developed a new appreciation for health and vitality. Nearly one in five patients (17.8%) developed faith or strengthened their religious beliefs.

Conclusion: Multiple injured patients risk developing multiple psychological effects including PTSD, anxiety, or depression. However, patients can also experience different psychological developments. As clinicians we must keep these effects in mind, offering psychiatric consultation where needed, while fostering and supporting potential positive developments.

Session XVI: WTC II Session: Prevention/Outcomes
Paper 5: 4:45pm - 5:45pm

TRAUMA, TREATMENT AND REHABILITATION: A PATIENTS' PERSPECTIVE

Eva Visser MSc., Brenda Den Oudsten Ph.D., Taco Gosens MD,Ph.D., Marjan Traa Ph.D., Jolanda De Vries Ph.D., Elisabeth-TweeSteden Hospital

Introduction: Qualitative research that focusses on the process of treatment and rehabilitation in relation to psychological factors after trauma is lacking. Using focus groups, the aim was to explore patients' experiences with the trauma, treatment and rehabilitation.

Methods: Trauma patients, treated in the shock room of the Elisabeth-TweeSteden Hospital, The Netherlands, participated in a focus group. Purposive sampling was used. Exclusion criteria were younger than 18 years old, severe traumatic brain injury, dementia, insufficient knowledge of the Dutch language. The interviews were recorded, transcribed verbatim and analyzed using coding technique open, axial and selective coding.

Results: Six focus groups were held before data saturation was reached. Then, no new information was found during the discussion. In total, 134 patients were invited, 28 (21%) agreed to participate (Age median: 59.5; min. 18 – max. 84). Main reasons to decline were fear that the discussion would be too confronting or patients experienced no problems regarding the trauma or treatment. Participants reported difficulties on physical (no recovery to pre-trauma level), psychological (fear of dying or for permanent limitations, symptoms of posttraumatic stress disorder, cognitive dysfunction), social (impact on relatives and social support) and environmental domains (satisfaction with care). Good communication regarding recovery is imperative, whereas clarity about the injury and expectations regarding recovery and future perspectives needs to be explained. Good communication seems to be related to surrendering to care and reduced feelings of helplessness and loss of control.

Conclusion: This is the first study that explored patients' experiences with the trauma, treatment and rehabilitation. Our findings illustrate the need for awareness and knowledge in health care providers about the consequences on several domains. Improvement in care can be accomplished after awareness, improved adjustment in communication and a multidisciplinary team is created. Professionals with the knowledge of consequences after trauma can better anticipate on patients' need.

WTC 11: Trauma Systems **Sponsored by Chinese Medical Doctor Association Trauma Committee (CMDATC)**

Moderators: Marc deMoya, MD and Xiao-Bing Fu, MD, PhD, USA and China
Keynote: Zhanfei Li, MD, PhD, Trauma System Development in China

APPLYING THE 5-PILLAR MATRIX TO THE DECADE OF ACTION FOR ROAD SAFETY IN QATAR: IDENTIFYING GAPS AND PRIORITIES
Presenter: Ruben Peralta, MD, Qatar

ROLE OF REVISED TRAUMA SCORE AND KAMPALA TRAUMA SCORE IN LOW AND MIDDLE INCOME COUNTRIES - ASSESSING FEASIBILITY, ACCURACY AND UTILITY IN RURAL INDIA
Presenter: Maunil Bhatt, MD, BS, USA

AN 18-YEAR ANALYSIS OF BORDER FENCE INJURIES
Presenter: Theresa Chan, MD, USA

"INTEGRATION" IS THE KEY FACTOR TO DEVELOP PREHOSPITAL TRAUMA CARE SYSTEM IN THE LEAST DEVELOPING COUNTRIES
Presenter: Takaaki Suzuki, MD, Japan

THE CHALLENGING AND STRATEGIES FOR TRAUMA CARE IN CHINA
Presenter: Zhanfei Li, MD, PhD, China

Session XVI: WTC II Session: Trauma Systems
Paper 1: 4:45pm - 5:45pm

APPLYING THE 5-PILLAR MATRIX TO THE DECADE OF ACTION FOR ROAD SAFETY IN QATAR: IDENTIFYING GAPS AND PRIORITIES

R. Consunji MD,MPH, A. El-Menyar MD, H Al-Thani MBA,MD, Ruben Peralta MD, FACS, FCCM Hamad General Hospital And Hamad Medical Corporation

Introduction: Road traffic injuries [RTIs] are the leading cause of death in Qatar; consequently, the country has participated in the Decade of Action for Road Safety [DoARS] coordinated by the United Nations Road Safety Collaboration, since 2011. Its goal is to reduce the number of road traffic deaths and injuries by 50% by 2020, by implementing activities, in the areas of road safety management, safer roads, safer vehicles, safer road users and post-crash response, the 5-Pillars. This study evaluated the DoARS initiatives and programs implemented in Qatar, to identify areas for future prioritization and focus.

Methods: Data, on completed or ongoing road safety initiatives for the years 2011-16, was collected from the key stakeholders, governmental and non-governmental, involved in road safety. This data was analyzed in the 5-Pillar Matrix, created, based on the DoARS Action Plan [Table 1].

Table 1: Five Pillars DoARS* Matrix [Abridged], 2011 to 2016, Qatar.
Traffic Department, Ministry of Interior, National Traffic Safety Committee, Ministry of Public Works, Ministry of Public Health and Hamad Medical Corporation
*Based on UNRSC, DoARS Road Safety Action Plan

Activity	Pillar 1: Road safety management [4/5]	Pillar 2: Safer roads & mobility [5/5]	Pillar 3: Safer vehicles [0/7]	Pillar 4: Safer road users [4/8]	Pillar 5: Post-crash response [6/7]
1	**Establish a lead agency**	**Promote road safety ownership & accountability**	*Apply UN motor vehicle safety regulations*	**Road safety awareness & social marketing campaigns**	**Develop prehospital care systems**
2	**Develop a national strategy**	**Promoting the needs of all road users**	*Use new car assessment programs*	**Speed limits & rules**	**Develop hospital trauma care systems**
3	**Set realistic & long-term targets based on national traffic crash data**	**Safe operation, maintenance & improvement of existing road infrastructure**	*New motor vehicles are equipped with seat-belts & anchorages*	**Drink–driving laws & evidence-based standards & rules**	**Provide early rehabilitation & support to injured patients.**
4	**Ensure that funding is sufficient for activities**	**Promote the development of safe new infrastructure**	*Universal deployment of Electronic Stability Control & Anti-Lock Braking Systems*	**Standards & rules for motorcycle helmets**	**Establishment of appropriate road user insurance schemes**
5	*Establish & support data systems*	**Encourage capacity building & knowledge transfer**	*Incentivize motor vehicles that provide high levels of road user protection*	*Standards & rules for seat-belts & child restraints to reduce crash injuries*	**Crash investigation & an effective legal response to road deaths & injuries**
6		**Encourage research & development in safer roads & mobility**	*Pedestrian protection regulations & safety technologies*	*Standards & rules for commercial freight & transport vehicles, & other public & private vehicle fleets*	*Encouragement & incentives for employers to hire & retain people with disabilities.*
7			*Fleets with vehicles that offer advanced safety technologies & high levels of occupant protection.*	*Policies & practices to reduce work-related road traffic injuries in the public, private & informal sectors.*	**Encourage research & development into improving post-crash response.**
8				*Establishment of Graduated Driver Licensing systems for novice drivers.*	
DoARS Compliance	80%	100%	0%	50%	86%

Non-compliance with indicators are shown in *italics*. Compliance with indicators is shown in **bold**.

Results: Pillars 2 [Safer Roads] and 5 [Post-Crash Response] met most of the DoARS indicators, 100% and 86% respectively, while Pillar 3 [Safer Vehicles] complied with none. Previously non-existent, legislative and policy indicators were the least likely to be completed. Systems, programs and laws that were already existent in 2011 and involving road engineering or healthcare systems were more likely to be in compliance with DoARS indicators.

Conclusion: To build on the initial gains of DoARS, Qatar must go beyond activities and programs that were already existent in 2011. It must prioritize proven interventions that make vehicles and road users safer; i.e. more stringent vehicle safety standards and graduated driver licensing for novice drivers.

Session XVI: WTC II Session: Trauma Systems
Paper 2: 4:45pm - 5:45pm

ROLE OF REVISED TRAUMA SCORE AND KAMPALA TRAUMA SCORE IN LOW AND MIDDLE INCOME COUNTRIES - ASSESSING FEASIBILITY, ACCURACY AND UTILITY IN RURAL INDIA

Maunil Bhatt BS,MD, Mayur Shinde BS, Kandarp Talati BS,MPH, Ajay Phatak BS,MPH, Karthik Vishwanathan BS, M.S, Somashekhar Nimbalkar BS,MD, Heena Santry BS,MD, Boston University Medical Center

Introduction: Annually, trauma causes more than 5.8 million deaths worldwide, with low and middle income countries (LMICs) accounting for the vast majority of these deaths. While predictors of mortality have long been studied and validated in high-income countries (HICs), risk predictors such as the Injury Severity Score (ISS) are of low utility in resource poor settings. As a result, both the Revised Trauma Score (RTS) and Kampala Trauma Score (KTS) have been developed and tested in LMICs, largely in urban areas. We aimed to validate RTS and KTS as predictors of mortality as well as disposition from a trauma department in rural western India.

Methods: Retrospective analysis of prospectively collected trauma registry data at a 550 bed tertiary care hospital serving a rural catchment area of 11,300 sq km of Gujarat, India was conducted. Patients presenting to the emergency room with all mechanisms of injury between September 1, 2017 to February 12, 2018 were included. Patients pronounced 'dead on arrival' were excluded. Primary outcome was in-hospital mortality. Secondary outcome was disposition from the trauma department (treated and discharged vs hospitalized). RTS and KTS were evaluated as predictors of in-hospital mortality by using logistic regression models. The sensitivity and specificity of each score was assessed using the area under the receiver operating curve (ROC). Pearson's X2 goodness of fit test was performed to assess the above mentioned associations.

Results: Of 1601 patients included in the trauma registry, 479 had enough data points recorded to calculate both the RTS and the KTS. Missing respiratory rate was the most common reason for inability to calculate these measures. Of these, 71% were males, median age was 32 (IQR 19.5 - 44.5) years and the most common cause of injury was road traffic accidents (54%, 258/479), followed by falls (23%, 110/479). 33 patients died in the hospital. 47% patients required inpatient admission, 29% patients were treated and discharged from the trauma department, and 20% left against medical advice. Logistic regressions revealed that both RTS [OR 0.39, 95% CI 0.28 - 0.55, $p < 0.001$] and KTS [OR 0.41, 95% CI 0.27 - 0.62, $p < 0.001$] were strong predictors of in-hospital mortality.

Both the scores demonstrated adequate level of fit based on the Pearson's X^2 goodness-of-fit test ($X^2 < 0.0001$). The area under the curve (AUC) for RTS (0.766) and KTS (0.783) were similar ($p = 0.78$). For patients with RTS < 4.5, the probability of in-hospital death was > 25% in our cohort. Additionally, both the scores were significant predictors of requiring hospitalization (RTS: OR 0.18, 95% CI 0.04 - 0.74, $p = 0.018$; KTS: OR 0.10, 95% CI 0.06 - 0.17, $p < 0.0001$). Only 3% (8/268) patients discharged directly from the trauma department required readmission within 30 days.

Conclusion: In rural LMIC settings when ISS is impractical to calculate, less resource intensive scoring systems such as RTS and KTS perform equally well as significant predictors of mortality. Both scores can also be utilized to predict safe and successful discharge directly from the trauma department. This can further guide the clinical practice in LMICs where resources are sparse and need to be rationed. However, to maximize utility of these measures in the future, it will be important to encourage full recording of key data such as respiratory rate that preclude such calculations.

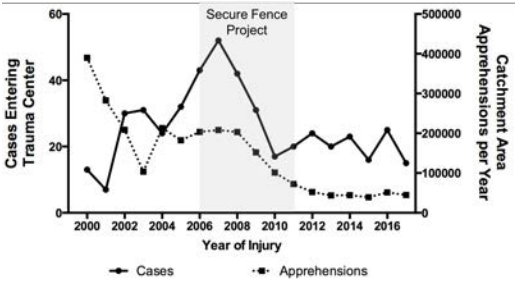
Session XVI: WTC II Session: Trauma Systems
Paper 3: 4:45pm - 5:45pm

AN 18-YEAR ANALYSIS OF BORDER FENCE INJURIES

Theresa W. Chan MD, Todd W. Costantini MD, Laura N. Godat MD, Alan Smith MPH,Ph.D., Jay J. Doucet MD, University of California, San Diego

Introduction: The southwest portion of the US-Mexico border remains the greatest contributing sector to national border apprehensions. Policy increasing the length and height of the fence has previously affected the number and severity of intentional border jump or fall cases seen at US border trauma centers. The Secure Fence Act of 2006 which increased the height, length and reinforcement of the area border fence was more than 99% complete by 2011. We hypothesized that policy and economic changes significantly affected numbers and severity of intentional border jump or fall cases seen over an 18-year period.

Methods: We performed a time-trend study using the Trauma Registry at a US Level 1 Trauma Center covering a portion of the US-Mexico border. Age, sex, injury severity score (ISS), and injured body regions for patients admitted after a border jump or fall from 2000 through 2017 were analyzed. The number of apprehensions in the Trauma Center's catchment border regions per year were obtained from US Customs and Border Protection data.



Results: A total of 465 admissions were coded as border jump or fall injuries. 72% were male with an average age of 33.0 ± 9.6 years. There was a significant decrease in the number of border jump or fall patients admitted from 43 in 2006 to 20 in 2011. This trend correlated with a decrease in apprehensions within the region but also an increase in the number of body regions affected per patient. Since 2011, the number of cases and apprehensions has remained stable. ISS also remained stable over the 18-year analysis with an overall average of 8.33. The highest mean ISS of 11.8 occurred in 2011, and the lowest mean ISS of 4.7 occurred in 2015.

Conclusion: During this 18-year period, the number of border jump or fall cases at the US-Mexico border has decreased and stabilized after completion of the Secure Fence Act. The overall ISS of border crossing jump or fall cases has remained unchanged but the number of body regions affected per patient has increased.

Session XVI: WTC II Session: Trauma Systems
Paper 4: 4:45pm - 5:45pm

"INTEGRATION" IS THE KEY FACTOR TO DEVELOP PREHOSPITAL TRAUMA CARE SYSTEM IN THE LEAST DEVELOPING COUNTRIES

Takaaki Suzuki MD, Yoshiaki Inoue MD,Ph.D., University Of Tsukuba

Introduction: Road traffic accidents (RTAs) is a global issue, and all countries are aimed to achieve SDGs 3.6, half deaths and injuries from RTAs. In fact, in most of the developing countries, the number of RTA deaths and injuries expected to rise. Emergency medical service (EMS) is one of the key factor to minimize the damage of RTAs. However, building a nationwide EMS is extremely challenging, especially in the least developing countries (LDCs). Lao People's Democratic Republic (Laos) is no exception.

Methods: Laos is one of the LDCs, which faces the rapid increase of RTAs. There is no public EMS existed and little is known about the trauma care system, especially about the prehospital settings. From January to February 2018, we have conducted an observational study in the capital Vientiane. We focused on visualizing the current prehospital settings and proposing the action plans for strengthening the capacity of post-crash response.

Results: In Vientiane, 8 private non-profit sectors are running the ambulance services. Since 2007, different ambulance services have been developed one after another. Today, due to the "disintegration" of services, the overlap calls and arrival of several ambulances at once were observed at the injury sites. The quality gap among services are evident, including transfer time and prehospital care treatment. We found most of the severe RTAs occur out of the town, but most of the stations where ambulance stands were located middle of the town. After our survey, we have set the 25 action plans to strengthen the trauma care system, including the establishment of a universal access number and command & control center.

Conclusion: There are many developing countries where private sectors run the ambulance services. "Disintegrated" prehospital trauma care system could cause transfer delay and the quality gap. Achieving a universal access number and command & control center in the early development stage are necessary.

Session XVI: WTC II Session: Trauma Systems
Paper 5: 4:45pm - 5:45pm

THE CHALLENGING AND STRATEGIES FOR TRAUMA CARE IN CHINA

Lianyang ZHANG MD, Professor, Xiuzhu ZHANG MD, Xiangjun BAI MD, Professor, Mao ZHANG MD, Professor, Xiaogang ZHAO MD, Professor, Yongan XU MD, Hao TAN MD, Yang LI MD, Third Affiliated Hospital, Army Military Medical University

Introduction: Trauma is one of the biggest public health problems in the world, as well as in China. In order to understand the current pitfalls in dealing with trauma care in China and to find out the solution, a survey was carried out between January 2010 and December 2014. Based on the success of the Advanced Trauma Life Support course and Primary Trauma Care course, a trauma-training program was propelled in China.

Methods: The authors and their colleagues surveyed 30 hospitals located in different parts of China, including 15 tertiary hospitals, 22 secondary hospitals, and 4 primary hospitals. A Standard Operating Procedure was established in advance and was used for face-to-face interviews and field surveys, with the primary objective of whether a trauma patient was admitted to a specific division, such as acute surgery and trauma surgery. Field survey covered both the hospital settings and the layout of the emergency departments, including hospital profiles, infrastructure for trauma care, trauma care capacity and pre-hospital response capacity.

Results: The study found that there were specialized trauma care facilities in 11 tertiary hospitals (73.33%), 4 secondary hospitals (36.36%) and 3 primary hospitals (75.00%). The common adverse aspects included: External factors – less desirably regulated operation of local EMS system, lack of effective inter-hospital transfers, no mandatory setups for trauma care required by legislation, no specialty such as the trauma surgery in the promotion system, the time-consuming training and the expanding scope of trauma care. Internal factors - the restrained development of trauma surgery, the less efficient operation of trauma care facilities, the lower time-sensitive management of the multiple trauma patients approached by intra-hospital consulting regime, the less satisfactory spatial accessibility among different interacting functional units, and confusing standard protocol with unnecessary patient transfers. Other findings include that the unique path for trauma care was less taken into consideration in tertiary hospitals, the care of traumatic brain injury or major thoracic trauma is less satisfied, traffic is poor, first-aid setups were far behind, long distance away from emergent department and insufficient storage of blood products, no resuscitation room for trauma patients in ED and prolonged pre-operative time. In June 2016, a panel of trauma committee experts from the Chinese Medical Doctor Association initiated a training course on trauma care with independent intellectual property right. In June 2017, 21 courses were organized.

Conclusion: Strategies for improving trauma care system in China include, at the national level - establishing and improving regulations and standards for designated trauma centers, setting up the “trauma/acute care” as a new discipline in medical colleges or universities, strengthening injury and trauma care capacity by certificated trauma training program; at the hospital level – reorganizing trauma team and trauma division at different levels of hospitals, establishing a trauma resuscitation area in ED and for improving “hardware” for ED and pre-hospital care facilities.

Key words: Challenging and strategies; Trauma care; China

WTC 12: Thoracic/Vascular **Austrian Council for Emergency Medicine (AGN)**

Location: Coronado DE, Fourth Level (Harbor Tower)

Moderator: Luke Leenen, MD and Paul Puchwein, MD, Netherlands and Austria
Keynote: Paul Puchwein, MD, Emergency Thoracotomy in Preclinical Setting-An Advantage of Physician Based EMS

A COMPARATIVE STUDY ON BOARDING OF MEDICAL STAFF OF HELICOPTER EMERGENCY MEDICAL SERVICE (HEMS) AND THE TRAUMA DEATH RATE: FOCUSING ON THE LOCAL REGIONAL TRAUMA CENTER
Presenter: John Lee, MD, PhD, South Korea

A QUALITY OF LIFE STUDY COMPARING PATIENT'S OUTCOME OF SURGICAL INTERVENTION FOR RIB FRACTURES: A PRELIMINARY, PROSPECTIVE, COHORT STUDY IN TAIWAN
Presenter: Tzu-hsin Lin, MD, Taiwan

CLINICAL SIGNIFICANCE OF ULTRASOUND IN PATIENTS WITH PENETRATING CHEST TRAUMA
Presenter: Alexander Smolyar, PhD, Russia

PENETRATING CARDIAC INJURIES IN THE 21ST CENTURY: HAS SURVIVAL IMPROVED?
Presenter: Christopher McNicoll, MD, USA

PREDICTORS FOR RETAINED HEMOTHORAX AMONG PATIENTS WITH PENETRATING THORACIC INJURIES
Presenter: Adolfo Gonzalez, MD, Columbia

Session XVI: WTC II Session: Thoracic/Vascular
Paper 1: 4:45pm - 5:45pm

A COMPARATIVE STUDY ON BOARDING OF MEDICAL STAFF OF HELICOPTER EMERGENCY MEDICAL SERVICE (HEMS AND THE TRAUMA DEATH RATE: FOCUSING ON THE LOCAL REGIONAL TRAUMA CENTER

John C. Lee MD,Ph.D., Tea-Youn Kim MPH, Yo Huh MD, Hojun Lee MD, Jonghwan Moon MD, Donghwan Choi MD, Byung Hee Kang MD, Seungwoo Chung MD, Kyoungwon Jung MD,Ph.D., Ajou University Hospital

Introduction: The importance of rapid transfer to designated regional trauma centers for the good outcome of severely traumatized patients cannot be emphasized enough. To this end, helicopters for emergency medical care have been established in most developed countries today, but there is still controversy about the proper boarding personnel to provide professional prehospital care during the air transportation. The purpose of this study was to compare the outcomes in traumatic patients with trauma surgeons on board with outcomes in those with paramedics on board during transportation flights to the regional trauma centers by helicopter.

Methods: Among the patients who were transferred to the two regional trauma centers from January 2012 to December 2017, adult blunt patients who were referred to the 'air transportation' as a means of transfer in the trauma database system were included. The information on the transfer was taken from the 'EMERGENCY MEDICAL SERVICE REPORT' prepared by the EMTs and the electronic medical records of the trauma center were used. Trauma Team Staffed HEMS (TTS-HEMS) and EMT-HEMS (Emergency Medical Technicians HEMS) were compared. The trauma and injury severity score (TRISS), the injury severity score (ISS) and the revised trauma score (RTS) were used to classify the trauma patients. Z statistics and W statistics were calculated to compare the predicted survival rate with the actual survival rate of the study population.

Results: A total of 662 trauma patients were transferred to the regional trauma center using HEMS. A total of 435 adult patients were included in the analysis except for pediatric, penetrating, drowning, hanging, Dead on Arrival (DOA) and Dead in Emergency Department (DIED). Of these, 327 (75.2%) were TTS-HEMS and 108 (24.8%) were EMT-HEMS. The TTS-HEMS was 266 subjects (81.3%) who exceeded the ISS 15 compared with the EMT-HEMS 44 subjects (40.7%) were statistically significant. During the transfer, TTS-HEMS could be treated with endotracheal intubation, transfusion, and thoracotomy + open cardiac massage, but EMT-HEMS could only perform basic treatment based on basic life support (BLS). When the predicted survival rate was calculated using TRISS, the actual survival rate of overall HEMS (Z statistic = 4.40 , $p < 0.001$, W statistic = 3.77) and TTS-HEMS (Z statistic = 3.69, $p < 0.001$, W statistic = 3.79) were statistically significantly higher than the predicted survival rate. The actual survival rate of TTS-HEMS was statistically significantly higher than the predicted survival rate in the subgroup of the severely injured patient(ISS ≥25)(Z statistic = 3.56, $p < 0.001$, W statistic = 18.44). In the subgroup of mild (ISS <15) and moderate (16 ≤ ISS <24), there were no statistically significant difference between actual survival and predicted survival.

Conclusion: As a result of analyzing HEMS conducted for adult blunt trauma patients, when trauma team staff participated in the transfer, the actual survival rate was higher than the predicted by TRISS despite the high severity. Improvement in treatment result was not confirmed when boarding only by EMT.

Session XVI: WTC II Session: Thoracic/Vascular
Paper 2: 4:45pm - 5:45pm

A QUALITY OF LIFE STUDY COMPARING PATIENT'S OUTCOME OF SURGICAL INTERVENTION FOR RIB FRACTURES: A PRELIMINARY, PROSPECTIVE, COHORT STUDY IN TAIWAN

Tzu-hsin Lin MD, Hui-Lin C. Wang MD, Chi-Cheng Yang Ph.D., Chun-Hsiung Huuang MD, Shien-Chi Liaw MD, NATIONAL Taiwan University Hopsital

Introduction: Traumatic rib fracture is the most common cause of chest injury. For so many years, most of patients were treated with non-operative methods such as pain control or rib brace. Recently, surgical intervention for rib fixation becomes more and more adopted as a treatment modality because of its effects on lessening pain scale and shortening length of stays (LOS). Despite all the abundant literature related to the rib fractures, there are still very few investigations using Quality of life (QoL) measurement to compare the outcomes of patients with rib fractures. Therefore, the goal of the present study is to compare the subjective outcomes of these patients measured by QoL instruments and their timing and possibility of return to work.

Methods: Since July, 2017 we started a prospective, cohort study of rib fractures in three major hospitals of northern Taiwan using Short-form 36 (SF-36) and Work Quality Index (WQI) to measure the quality of life among these patients after admission. Patients of rib fractures in these three hospitals were asked their willingness to join our study and to have surgery or not. We performed several screw-plate systems for rib fixation. For the operative groups, we collected the results of these two questionnaires at 5 time points (Pre-operative, Post-operative, 1 months, 3 months and 6 months). If patients chose not to have surgery, the first two interviews will be conducted as within 3 days of admission and 1~2 day before discharge.

Results: Up to now, we have recruited 21 patients in this multi-centered QoL study. There are slightly more patients (12/21, 57.14%) chose to have surgery. The average age of these patients are 61.9 years old and the gender of study patients is predominantly male (16/21, 76.2%). The majority of patients have been admitted to ICU (16/21, 76.2%) and the average length of stay (LOS) in ICU is 4.75 days. The total LOS of these patients is 8.8 days. The average number of fractured ribs in these patients are 5.57 ribs. To show the comparative effects of surgery, we found younger patients are more inclined to have rib fixation (average: 55.2 years old in operative group vs 70.8 years old in non-operative group, $p< 0.001$). The surgical patients have slightly longer LOS (9.25 days in operative group vs 8.22 days in non-operative group). In terms of QoL results, the most significant finding is except pain scale, most physical, emotional and social limitations are decreased in operative groups and the effects become stronger until 1 ~ 3 months. The chance of return to work, measured by WQI, showed that there are 6 patients already back to work. Among those already back to work at 1 month of follow-up, most patients are in surgical group (5/6, 83.36%).

Conclusion: Our study is the first study to show that rib fixation has better effects on helping patient recovery, both in QoL and work quality. Beyond traditional pain score measurements and physiological parameters such as pulmonary function test and lung volume, the results of this study encourage more patients to have surgery to improve the quality of life and their ability to return to work. Further study of larger scales should be done to investigate the economic impacts on the society after rib fixation.

Session XVI: WTC II Session: Thoracic/Vascular
Paper 3: 4:45pm - 5:45pm

CLINICAL SIGNIFICANCE OF ULTRASOUND IN PATIENTS WITH PENETRATING CHEST TRAUMA

Alexander Smolyar Ph.D., Domodedovo Central City Hospital

Introduction: Treatment of patients with penetrating chest trauma depends on accuracy and velocity of examination. Focused assessment with sonography for trauma (FAST), computed tomography and pericardial window are used as diagnostic tools.

Methods: Patients with open wound admitted to level 1 trauma center from 1st of January to 31st of December 2016 were included in retrospective non-randomized study. Heart injury was suggested if the wound was located in the "precardial box". Findings of ultrasonography of pericardium were taken into account only in such cases. Patients in extremes were excluded from the survey. Any amount of fluid in the pleural cavities, or discrepancy between pericardium and heart more than 5 mm in diastole was considered as a positive result. The results of FAST were controlled by follow-up observation, CT or operation. Chest X-ray was also performed. Local wound exploration and suturing was fulfilled after preoperative examinations. Depending on intensity of intrapleural bleeding in the patients with penetratin wound, suturing with tube thoracostomy, VATS, or thoracotomy was performed. The presence of hemothorax and hemopericardium, which was detected by FAST preoperatively, was confirmed or disproved during surgery. All patients were admitted to hospital for observation. Chest X-ray, ultrasound examination of pleural cavities and echocardiography were repeated when necessary. Sensitivity, specificity, positive and negative predictive value and their 95% confidence interval were calculated.

Results: The relationship between FAST and intraoperative findings was explored in 547 patients with chest wound, of which 155 had one in the "precardial box", and are presented in the tables 1 and 2. Sensitivity, specificity, negative and positive predictive value of ultrasound results are presented in table 3.

Table 1. The relationship between FAST of the pleural cavities and real hemothorax.

Hemothorax	during operation	
US result	Yes	No
Yes	111	7
No	63	366

Table 2. The relationship between FAST of pericardial cavity and real hemopericardium.

Hemopericardium	during operation	
US result	Yes	No
Yes	11	7
No	7	130

Table 3. Sensitivity, specificity and predictive value of FAST.

US	Sens. %, (95% CI*)	Spec. %, (95% CI)	NPV %, (95% CI)	PPV %, (95% CI)
Pleural cavities (n=547)	63,8 (59,7-67,9)	98,1 (97,0-99,2)	85,3 (82,3-88,3)	94,1 (92,1-96,1)
Pericardium (n=155)	61,1 (53,4-68,8)	94,9 (91,4-98,4)	94,9 (91,4-98,4)	61,1 (53,4-68,8)

Se*95%CI

- 95% confidence interval, NPV - negative predictive value, PPV - positive predictive valuensitivity, specificity and predictive value of FAST.

Conclusion: Positive result of FAST in patients with open injuries clearly indicates a penetrating character of the wounds. A negative ultrasound result does not exclude serious internal organ injuries, and therefore such patients require further observation and instrumental investigations.

Session XVI: WTC II Session: Thoracic/Vascular
Paper 4: 4:45pm - 5:45pm

PENETRATING CARDIAC INJURIES IN THE 21ST CENTURY: HAS SURVIVAL IMPROVED?

Christopher F. McNicoll MD, Paul J. Chestovich MD, Purvi P. Patel MD, Patricia Souchon MD, Mallory Hamilton MD, Esmeralda Clark NP, Douglas R. Fraser MD, Deborah A. Kuhls MD, John J. Fildes MD, University Of Nevada Las Vegas School Of Medicine

Introduction: Penetrating cardiac injuries (PCI) are often fatal despite rapid pre-hospital care. Although many studies have identified risk factors for mortality, few studies have included non-transported field mortalities, and none published in the 21st century. This study analyzes penetrating cardiac injuries including hospital and coroner reports in the current era.

Methods: 17-years of records were reviewed, including trauma center (TC) registry, medical records, and coroner reports from 2000-2016. Identified PCI was graded using the AAST cardiac organ injury score (COIS). Subjects were divided into three groups: field deaths, hospital deaths, and survived to hospital discharge. The primary outcome is survival to hospital discharge overall and among those transported to the hospital.

Results: During the study period, 834 patients were identified, and after excluding 243 for inadequate data, 591 PCI patients were analyzed. Mean age was 38.1 ± 17.5 years, and survivors (n=66) were significantly younger than field deaths (n=359) (32.6 vs. 41.1, $p<0.001$). Stab wounds (n=173) had improved survival compared to gunshot wounds (n=470) (26.6% vs. 4.3%, $p<0.001$). COIS grades 4 to 6 (n=602) had lower survival than grades 1 to 3 (n=41) (8.3% vs. 39.0%, $p<0.001$). Survivors (n=66) had lower median COIS than patients who died in hospital (n=218) (4 vs. 5, $p<0.001$). Single chamber PCI had higher survival than multiple chamber PCI (13% vs. 5%, $p=0.004$) (Table1). Of single chamber injuries, the left ventricle is the most injured (n=177), and right ventricle PCI has the highest survival ($p<0.001$). Of field deaths, left ventricular injuries had the greatest single chamber mortality (60%), equaling multi-chamber PCI (60%). Overall and hospital survival are similar to previous reports from Campbell et. al and Rhee et. al, who reported overall survival of 2.9% and 19.3% and hospital survival of 50% and 42.7% (Table 2).

Conclusion: Survival to both TC evaluation and hospital discharge following PCI is influenced by many factors including age, mechanism, anatomic site, and grade. Despite advances in trauma care, survival has not appreciably improved.

Table 1

	Total	Field Death	Hospital Death	Surv to Hosp Disch	p-value†
OVERALL	591	313 (53%)	212 (36%)	66 (11%)	
Pericardial Injury	18	2 (11%)	7 (39%)	9 (50%)	<0.001‡
Left Ventricle	177	106 (60%)	60 (34%)	11 (6%)	<0.001[o]
Right Ventricle	119	43 (36%)	46 (39%)	30 (25%)	<0.001[o]
Left Atrium	29	17 (59%)	10 (34%)	2 (7%)	0.335[o]
Right Atrium	48	26 (54%)	18 (38%)	4 (8%)	0.34[o]
Single Chamber	373	192 (51%)	134 (36%)	47 (13%)	0.004[a]
Multiple Chambers	200	119 (60%)	71 (35%)	10 (5%)	
2 Chambers	161	89 (55%)	63 (39%)	9 (6%)	0.015[b]
3 or 4 Chambers	39	30 (77%)	8 (21%)	1 (2%)	0.063[b]

Table 2

	Campbell et. al	Rhee et. al	Current Study
Total Patients	1198	212	591
Field Deaths	1128 (94%)	116 (55%)	313 (53%)
Hospital Deaths	35 (3%)	55 (26%)	212 (36%)
Survived	35 (3%)	41 (19%)	66 (11%)

†Comparing survivors vs. hospital+field deaths, for each row
‡Chi-square vs. all other PCI
[o]Chi-square vs. all other single-chamber PCI
[a]Chi-square vs. all other PCI excluding pericardial injuries (n=573)
[b]Chi-square vs. single chamber PCI

Session XVI: WTC II Session: Thoracic/Vascular
Paper 5: 4:45pm - 5:45pm

PREDICTORS FOR RETAINED HEMOTHORAX AMONG PATIENTS WITH PENETRATING THORACIC INJURIES

ADOLFO GONZALEZ MD, ALBERTO F. GARCIA MD, ALEXANDER SALCEDO MD, JOSE J. SERNA MD, ORLANDO AREVALO MD, SUSAN GUERRERO MD, DIEGO VALDEZ MD, DIANA MARMOLEJO YEYSON MONTERO LINA GRISALES VICTOR MORENO ALVARO I. SANCHEZ MD,Ph.D., JUAN C. PUYANA* MD, UNIVERSIDAD DEL VALLE

Introduction: Tube thoracostomy (TT) is the most common procedure for thoracic trauma. Retained hemothorax (RH) is a frequent complication in patients requiring a TT after penetrating trauma. It is associated with higher risk of empyema, prolonged length of stay and increasing costs. Risk factors of RH have been poorly studied in subjects with TT after penetrating chest trauma (PCT). We aimed to investigate clinical predictors of retained hemothorax among patients with penetrating thoracic injuries.

Methods: We conducted an observational study of 324 patients with PCT who required a TT within the first 48 hours from injury. Patients admitted to the emergency department in shock, who required an emergent or urgent thoracotomy, or those who were transferred or died within 48 hours after the injury, were excluded. Demographics, injury characteristics, and clinical and surgical information were prospectively collected during hospitalization. Retained hemothorax was defined as blood in the pleural cavity observed on X-ray or computed tomography scan that could not be drained through the TT and required surgical intervention (thoracotomy or video-assisted thoracoscopy). Predictors for RH were assessed using stepwise logistic regressions.

Results: Retained hemothorax was observed in 41 (12.6%) patients. The final regression model indicated that total drainage greater than 750mL (odds ratio [OR], 2.00; 95% confidence interval [CI], 1.41-2.81) and changing tube procedures (OR, 4.62; 95%CI, 1.68-12.7) were independent risk factor of retained hemothorax. Patients who underwent laparotomies were at lower risk of developing retained hemothorax (OR, 0.05; 95%CI, 0.00-0.47). Injury severity, delay in the TT insertion and the requirement of two or more chest tubes were not independent predictors of RH.

Conclusion: In patients with PCT, emphasis on continuous quantification of pleural drainage and proper chest tube placement are important factors for reducing the risk of RH. Improved pain management and chest physiotherapy after abdominal surgery may in part explain the reduced risk of RH after laparotomy.

WTC 13: Emergency General Surgery **Sponsored by WSES**

Location: Harbor A, Fourth Level (Harbor Tower)

Moderators: Carlos Mesquita, MD and Federico Coccolini, MD, Portugal and Italy
Keynote: Federico Coccolini, MD, Acute Cholecystitis GL,

A STUDY OF POST-OPERATIVE COMPLICATIONS IN AN EMERGENCY GENERAL SURGERY FIRM IN 2017
Presenter: Chris Cremona, MD, Brazil

COMPLICATION RATES IN EMERGENT VERSUS DELAYED SURGICAL INTERVENTION FOR ACUTE CHOLECYSTITIS – A RETROSPECTIVE REVIEW
Presenter: Christopher Rice, BS, USA

DOES THE "HALO EFFECT" OF TRAUMA CENTER DESIGNATION EXTEND TO SEVERE POSTPARTUM HEMORRHAGE? A FOUR YEAR RETROSPECTIVE REVIEW OF LEVEL 1 TRAUMA CENTERS IN AMERICA
Presenter: Phoenix Vuong, MD, USA

SURGICAL RESCUE IN A MAJOR HIGH VOLUME URBAN EMERGENCY GENERAL SURGERY (EGS) SERVICE USING AN ELECTRONIC AUTOMATIC EMERGENCY GENERAL SURGERY REGISTRY
Presenter: Maria Jimenez, MD, Colombia

ESTIMATING THE ECONOMIC BURDEN OF ENTERIC FISTULA AFTER DAMAGE-CONTROL LAPAROTOMIES: A SYSTEMATIC REVIEW AND META-ANALYSIS
Presenter: Felix Chang, MBA, USA

Session XVI: WTC II Session: Emergency General Surgery
Paper 1: 4:45pm - 5:45pm

A STUDY OF POST-OPERATIVE COMPLICATIONS IN AN EMERGENCY GENERAL SURGERY FIRM IN 2017

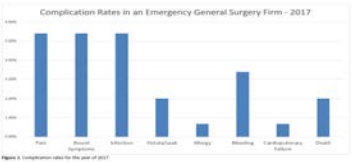
Chris Cremona MD, Predrag Andrejevic* MD, Attila Csengeri MD, Mater Dei Hospital

Introduction: The aim of this study was to provide a basic statistical assessment of the post-operative complications within a 30-day period of a local emergency general surgery firm using the Clavien-Dindo classification. The data collected pertains to all surgeries performed by this surgical firm over the course of 2017.

Methods: Trainees working in this firm were responsible for data collection. Every patient who underwent emergency surgery during the calendar year of 2017 had the following details collected - the presence or absence of a complication in the 30-day post-operative period, the type of complication and description of complication along with the grade of the complication (see Fig 1.) and the total number of complications for any given patient were documented. Patients who underwent intermediate to major surgery were followed up at outpatients and were specifically asked for the occurrence of complications from the point of discharge up until the outpatient appointment. With one centralised national hospital - the people who were discharged and subsequently experienced considerable or major complications invariably represented back to hospital via the A&E department. Some patients kept in touch giving verbal feedback and the rest were contacted and asked for any post-operative complications after discharge within this 30-day period.

I	Any deviation from the normal postoperative course without need of intervention beyond the administration of antiemetics, antipyretics, analgesics, diuretics, electrolytes and physiotherapy.	
II	Complications requiring pharmacological treatment with other medicines beyond the ones used for the complications of degree I.	
III	Complications requiring surgical, endoscopic or radiological intervention	
	IIIA Without general anaesthesia	IIIB Under general anaesthesia
IV	Life-threatening complication requiring admission to ITU	
	IVA Single organ dysfunction (including dialysis)	IVB Multi-organ dysfunction
IV	Death	

Fig.1 – Severity Scale of Complications of Clavien-Dindo Classification



Results: A total of 148 emergency surgeries were performed by this surgical firm in 2017. Of these 148 cases – 29 patients experienced post-operative complications within the first 30 days after their procedure. This equated to a complication rate of 19.59%. 24 of the 29 patients experienced just one complication, whilst the other five patients experienced two complications from the same procedure. Thus, giving a total of 34 complications for all the surgeries performed by this firm in 2017. The most common complications were abdominal pain, nausea & vomiting, and wound infection. There were 8 complications for each of these 3 categories. Post-operative bleeding occurred in 5 cases with fistulas or leak of an anastomosis occurring in 3 cases. Death of a patient occurred in 3 instances once as a result of post-operative bleeding from the site of anastomosis after a Whipple's procedure, the 2nd occurred subsequent to post-operative bleeding from a peptic ulcer and in the 3rd case occurred in an instance of faecal peritonitis as a result of anastomotic failure after a Roux-en-Y bypass for a patient with pancreatic malignancy.

Conclusion: The Davien-Clindo classification proved to be simple, efficient and useful in analysing post-operative outcomes. The results of this study prove that despite that the vast proportion of emergency cases in a predominantly elderly cohort at times going laparoscopic or minimally invasive surgery – the complication rates were similar to other foreign studies who had younger cohorts undergoing elective surgery.

Session XVI: WTC II Session: Emergency General Surgery
Paper 2: 4:45pm - 5:45pm

COMPLICATION RATES IN EMERGENT VERSUS DELAYED SURGICAL INTERVENTION FOR ACUTE CHOLECYSTITIS – A RETROSPECTIVE REVIEW

Christopher P. Rice BS, Celia Chao MD, Daniel Jupiter Ph.D., Winston Chan BS, August Schaeffer BS, Lance W. Griffin MD, Whitney R. Jenson MD, William Mileski* MD, University of Texas Medical Branch - Galveston

Introduction: The last several years have seen considerable enthusiasm endorsing the adoption of clinical pathways recommending early cholecystectomy for patients presenting with complicated gallstone disease. We evaluated the differences between "Emergent" (operation performed on the initial hospital admission) versus "Delayed" (operation scheduled for and performed at a later date) for acute cholecystitis over a 7.5-year period.

Methods: Patients who underwent cholecystectomy for acute cholecystitis from June 2010 to December 2017 were identified using our tertiary referral center's acute care surgery registry and operative logs. Their cases were reviewed retrospectively from electronic medical records. Comparisons were analyzed with chi-square testing.

Results: Three hundred twenty-nine patients with acute cholecystitis were treated surgically on their initial encounter. Conversely, 107 patients presenting with acute cholecystitis were initially treated non-operatively and underwent a delayed cholecystectomy. There were 77 (23.4%) Emergent patients that developed intra- or post-op complications (including 7 deaths) and 13 (12.1%) complicated cases in the Delayed group (no deaths). In addition to deaths, the complications identified include common bile duct injuries, bile leaks, retained stones, abscesses, and reoperation for hemorrhage. The difference in complication rates between the Emergent group (23.4%) and the Delayed group (12.1%) was statistically significant ($p=0.012$, χ^2).

Conclusion: Our observations of significant surgical complications in patients undergoing early cholecystectomy for acute cholecystitis support a selective approach to surgery for complicated gallstone disease. Efforts should be made to identify patients at greatest risk for perioperative complications, especially death.

Session XVI: WTC II Session: Emergency General Surgery
Paper 3: 4:45pm - 5:45pm

DOES THE "HALO EFFECT" OF TRAUMA CENTER DESIGNATION EXTEND TO SEVERE POSTPARTUM HEMORRHAGE? A FOUR YEAR RETROSPECTIVE REVIEW OF LEVEL 1 TRAUMA CENTERS IN AMERICA

PHOENIX VUONG MD, Jason Sample MD, Arturo Torices-Dardon MD, Sarah Stankiewicz BS, Daniel Skupski MD, Pierre Saldinger MD, NEW YORK PRESBYTERIAN QUEENS

Introduction: High quality trauma services have been shown to improve outcomes of trauma patients. This “halo effect” has been shown to extend to patients with nontrauma surgical conditions such as ruptured abdominal aortic aneurysms. However, it remains unclear if this benefit is generalizable to other populations. We hypothesize that the discrepancy in outcomes in prior studies is related to the populations studied; specifically, that the “halo effect” of trauma centers encompasses noninjured patients in hemorrhagic shock. The aim of this study is to assess the impact of level 1 trauma center designation on outcomes for patients with severe postpartum hemorrhage (PPH).

Methods: The Nationwide Inpatient Sample for years 2008 to 2011 was reviewed. Patients with severe PPH were identified with a diagnosis code for postpartum hemorrhage requiring transfusion, hysterectomy, or surgical repair of the uterus. Trauma patients and patients transferred from other institutions were excluded. Hospitals were dichotomized into level 1 trauma centers (TC) versus non-level 1 trauma centers (NTC) by linking the American Hospital Association Annual Survey. Hospital and patient level covariates were evaluated including the Obstetric Comorbidity Index (OCI), a validated index used to predict maternal end-organ damage and mortality. Primary outcomes were end-organ injury or death. Multivariate logistic regression analysis was performed and potential confounders were included if univariate analysis showed $p < 0.10$.

Results: 11,135 patients were admitted with a diagnosis of severe PPH. The majority were hospitalized at NTC rather than TC (71.4% vs. 28.6%). Patients at NTC were younger, more likely to be white, admitted electively, insured, and healthier at baseline with a lower mean OCI (1.3 vs. 1.7; $p < 0.0001$). Patients at TC had higher rates of preeclampsia, congenital heart disease, sickle cell disease, multiple gestation, systemic lupus erythematosus, human immunodeficiency virus, placenta previa, hypertension, previous cesarean delivery, asthma, and diabetes mellitus. Overall inpatient mortality was less than 1% with no statistical difference between rates at NTC and TC. There was also no significant difference in rates of organ failure. However, after adjustment for differences in OCI, race, emergency admission status, patients at NTC had a significantly higher risk of respiratory failure (OR, 1.27; 95% CI, 1.01-1.59). The overall risk of either end organ failure or death, although not significantly different, was higher at NTC (OR, 1.11; 95% CI, 0.95-1.3).

Conclusion: We have found that in the care of patients with severe postpartum hemorrhage, level 1 trauma centers care for patients with an overall higher maternal comorbidity index. When adjusted for this and other confounders, patients at TC had improved respiratory outcomes. These patients also tended to have a lower, though not statistically significant, risk of acute maternal end-organ injury when compared to patients at NTC. These findings suggest that improvements in the care of patients at trauma centers may be transferable to non-trauma patients, and achievement of trauma center designation may indirectly improve the level of care provided to patients with severe PPH.

Session XVI: WTC II Session: Emergency General Surgery
Paper 4: 4:45pm - 5:45pm

SURGICAL RESCUE IN A MAJOR HIGH VOLUME URBAN EMERGENCY GENERAL SURGERY (EGS SERVICE USING AN ELECTRONIC AUTOMATIC EMERGENCY GENERAL SURGERY REGISTRY

Maria F. Jimenez* MD, Andres Isaza MD, Danny Conde MD, Felipe Borda Medical Student, Daniel Colmenares Medical Student, Alex Arroyo BS, Luis Bejarano BS, Juan C. Puyana* MD, Hospital Universitario Mederi

Introduction: Postoperative mortality is impacted by the speed and proper interventions implemented by an acute care surgeon to "rescue" complicated patients from death. Failure to rescue has been recently regarded as an important indicator of patient's safety and quality care. In our high surgical volume and low resources institution where there is no option to hire registrars to fed databases, an electronic Emergency General Surgery registry was recently developed to automatically capture in-hospital information and outcomes from the Electronic Medical Record (EMR).

Objective: The aim of this study is to describe the incidence of "surgical rescue" and outcomes of the complicated EGS patients at an inner city 1000 beds university major referral center.

Methods: A prospective electronic captured EGS (demographic, primary EGS coding, surgical procedures, surgical and outcomes) was used to screen for acute EGS surgical complications of operative procedures from June to July 2017 at a large urban academic medical center in a tertiary care facility. During morning rounds, emergency general surgeons prospectively identified, classified and included surgical complications in an online application that was also automatically captured in the electronic EGS registry. Surgical chart reviewers of complicated patients confirmed and validated the captured data. Only surgical complications requiring surgical procedure in the operating room were included.

Results: We identified 496 patients (55 years old ± 20; 57% female) who underwent to 524 EGS surgical procedures. Most common procedures were: laparoscopic cholecystectomy (25.6%), appendectomy (18.5%), drainage of intraabdominal collection (14.6%), and abdominal exploration (7%). for peritonitis or ischemia Thirteen patients of the 496 patients (2.6%) required "surgical rescue" defined as patients who were immediately intervened after identifying a surgical complication mainly for uncontrolled sepsis (43%) and anastomotic leaks (30%). The most common surgical intervention was source control of the infection (50%), bowel resection or intestinal repair (15%), and bleeding control (15%). Surgical rescue failure rate (inability to prevent death after de development of a surgical complication) was 15.4%.. Hospital length of stay, need for critical care and in-hospital mortality was higher in the surgical rescue patients compared to those without surgical complications.

Conclusion: Surgical failure to rescue rate was higher than similar high volume EGS services recently described. The development and implementation of an electronic automatic captured EGS registry database in our academic medical served to build best practices for "surgical rescue" and to drive quality improvement programs.

Session XVI: WTC II Session: Emergency General Surgery
Paper 5: 4:45pm - 5:45pm

ESTIMATING THE ECONOMIC BURDEN OF ENTERIC FISTULA AFTER DAMAGE-CONTROL LAPAROTOMIES: A SYSTEMATIC REVIEW AND META-ANALYSIS

Felix K. Chang MBA, Rondi B. Gelbard MD, Christopher J. Dente* MD, Allan D. Kirk MD,Ph.D., Timothy G. Buchman* MD,Ph.D., Eric A. Elster MD, Emory University

Introduction: Enteric fistula (EF) are a known complication after damage-control laparotomy (DCL) for severe traumatic injury. However, the total economic burden of EF in the United States is unknown. Defining the economic burden of fistula development is needed to provide the foundation for future research, advocacy, and education efforts.

Methods: This analysis combined a systematic review of data from the Agency for Healthcare Research and Quality's Healthcare Cost and Utilization Project (HCUP) with a meta-analysis of data from a Level 1 trauma center and a literature review from the PubMed and MEDLINE databases, covering January 1, 2000 through December 31, 2017. We selected data from HCUP by primary diagnosis ICD-9CM codes to determine an annual number of emergent laparotomies in the United States. Since the most recent HCUP data available to us was collected in 2014, we updated its figures to 2017, assuming that the proportion of laparotomy procedures to the U.S. population remained consistent over the three-year period. We then used ratios created from our meta-analysis of past medical studies to determine the number of specific types of laparotomies and their complications, specifically fistula development. Intensive care unit (ICU) and hospital lengths of stay (LOS) for DCL patients with and without fistula were analyzed to generate baseline costs. We then conducted an 80-hospital survey of direct charges for ICU and general ward stays, in conjunction with a ratio of professional to facility charges for patients with an Injury Severity Score ≥18, to determine the excess per-patient charges incurred by DCL patients with fistula. Applying those excess charges to the likely annual nationwide number of fistula developed, we then calculated the total economic burden of fistula development.

Results: There were between 13,526 and 19,938 emergent laparotomies in 2017. Of these, between 4,427 and 6,525 (or 32.7%) represented DCL. A fistula complication was likely to have arisen in 322 to 474 (or 7.3%) of these DCL cases. We estimate that the facility and professional charges required to treat DCL patients with EF was $309,150 versus $69,929 without EF, and the excess per-patient cost for EF treatment was $239,211. Nationally, we assess that the total economic burden of enterocutaneous and enteroatmospheric fistula after damage-control laparotomies to be between $77 million to $113 million.

Conclusion: This analysis fills a knowledge gap in the study of fistula development after DCL. The economic burden of fistula is substantial and significant in the United States.

Friday 9/28

6:15-7:15 am

Session XVII: WTC III Sessions

6:15-7:15 A.M.

WTC 14: Critical Care **Sponsored by Australasian Trauma Society**

Location: Harbor A, Second Level (Harbor Tower)

Moderators: Koji Morishita, MD and Zsolt Balogh, MD, PhD, Japan and Australia
Keynote: Zsolt Balogh, MD, PhD, Understanding Post Injury Inflammation for Better Timing of Definitive Surgical Intervention in Polytrauma

RHABDOMYOLYSIS AND ACUTE KIDNEY INJURY IN BLUNT TRAUMA PATIENTS
Presenter: Jung Yun Park, MD, South Korea

NEUROENTERIC AXIS MODULATES THE INTESTINAL CIRCULATION AFTER TRAUMA/ HEMORRHAGIC SHOCK
Presenter: Masayuki Yagi, MD, Japan

INCIDENCE OF ACUTE RESPIRATORY DISTRESS SYNDROME AND ASSOCIATED MORTALITY IN A POLYTRAUMA POPULATION
Presenter: Karlijn Van Wessem, MD, PhD, Netherlands

WITHDRAWN

STUDY OF SERUM COPPER LEVELS IN CONSERVATIVELY MANAGED HEAD INJURY PATIENTS WITH SPECIAL REFERENCE TO ITS SEVERITY AND OUTCOME
Presenter: Vinod Jain, MD, India

Session XVII: WTC III Session: Critical Care
Paper 1: 6:15am - 7:15am

Rhabdomyolysis and acute kidney injury in blunt trauma patients

Jung Yun Park MD, Yonsei University College Of Medicine

Introduction: Rhabdomyolysis (RB), which is a decomposition of skeletal muscles, is common in blunt trauma patients. RB can result in acute kidney injury (AKI) and sometimes it can be life-threatening. The aim of our study is to identify predictors of RB induced AKI from the initial patient information and parameters.

Methods: We retrospectively analyzed 727 blunt trauma patients admitted to a single tertiary hospital from January 2014 through December 2017. Patients who had chronic kidney disease previously diagnosed were excluded from the study. RB was defined as a creatine kinase (CK) level equal or greater than 1,000 U/L. The diagnosis of AKI was based on RIFLE criteria.

Results: The overall incidence of RB and AKI were 30.4 % (n = 221) and 12.2 % (n = 89), respectively. According to the univariate analysis, peak CK ($p = 0.045$), initial hemoglobin ($p = 0.010$), serum pH ($p = 0.001$), base excess ($p = 0.001$), lactate ($p = 0.008$), calcium ($p = 0.001$), magnesium ($p = 0.021$), ISS score ($p = 0.016$), and ISS of extremity ($p = 0.017$) were showed to be associated with RB induced AKI. And lactate appeared to be related to needs for RRT among RB associated AKI patients (p = 0.003). In multivariate analysis initial base excess (Odds ratio (OR) 0.862; 95 % confidence interval (CI) 0.775 - 0.959; $p = 0.006$) and initial serum calcium level (OR 0.563; 95% CI 0.373 - 0.849; $p = 0.006$) were shown to be associated independently with RB induced AKI.

Conclusion: Serum CK level is used diagnose RB, but it does not predict RB induced AKI. Low base excess and low serum calcium levels are independently associated with RB induced AKI. And serum lactate level seems to be associated with RRT in RB induced AKI patients.

Session XVII: WTC III Session: Critical Care
Paper 2: 6:15am - 7:15am

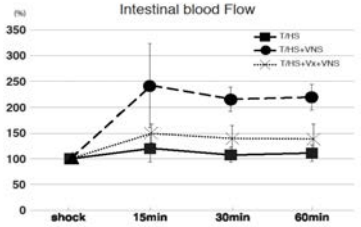
NEUROENTERIC AXIS MODULATES THE INTESTINAL CIRCULATION AFTER TRAUMA/HEMORRHAGIC SHOCK

Masayuki Yagi MD, Koji Morishita MD,Ph.D., Akinori Ueno Ph.D., Junichi Aiboshi MD,Ph.D., Hajime Nakamura BS, Hiroya Akabori MD,Ph.D., Mitsuaki Kojima MD,Ph.D., Atsushi Senda MD, Yasuhiro Otomo MD,Ph.D., Tokyo Medical And Dental University

Introduction: Gut barrier breakdown causes an intestinal inflammatory response generating the inflammatory mediators. Electrical vagus nerve stimulation (VNS) is known to prevent gut damage in animal models of trauma/hemorrhagic shock (T/HS) by altering the gut inflammatory response to acute injury, independent of the spleen. However, its effect on detailed electrophysiological function of the vagus nerve (VN) to the gut is unknown. Therefore, the aims of this study were: 1) to investigate the action potential of VN induced by VNS, 2) to evaluate the influence of evoked neural activity on the systemic circulation and intestinal blood flow (IBF), 3) to determine whether VNS improve the gut damage after T/HS.

Methods: 1) Male Sprague Dawley rats were anesthetized by isoflurane, and cervical and abdominal VN was exposed. One pair of bipolar electrodes were attached the cervical VN to stimulate the VN (square wave, 5V, 5Hz, 20min), and other two pairs of bipolar electrodes to the abdominal VN to measure the VN action potential. After the each VNS, the action potential was detected by threshold processing of band-pass-filtered (200-1000 Hz) recording from the abdominal VN. The mean arterial pressure (MAP) and heart rate (HR) were measured simultaneously. 2) Rats were randomly assigned to undergo T/HS, T/HS+VNS, or T/HS+Vagotomy (Vx)+VNS. The rats underwent the T/HS (MAP 25 mmHg for 30min) without fluid resuscitation and then received cervical VNS. A separate cohort of animals was subjected to abdominal Vx to disrupt the neuroenteric axis. The IBF was measured by laser Doppler flowmery. The gut was harvested to evaluate the gut injury.

Results: 1) The action potential was identified around the time point of 40±12 msec after each stimulus of VN in the normal condition. 2) VNS caused an approximately 3.2-fold increase in the IBF in comparison to shock phase ($p<0.05$). Abdominal Vx eliminated the effect of VNS on the IBF ($p<0.05$). The BP and HR were decreased for several seconds immediately after VNS, but the BP then rapidly increased from 25.2 mmHg to 52.1 (34.2-62.8 mmHg) and the HR showed a slight increase. 3) Performing VNS is tend to protect T/HS induced gut injury (MPO activity).



Conclusion: VNS causes VN action potential and improves the T/HS-induced IBF impairment. VNS may have a therapeutic impact on acute gut injury after T/HS.

Session XVII: WTC III Session: Critical Care
Paper 3: 6:15am - 7:15am

INCIDENCE OF ACUTE RESPIRATORY DISTRESS SYNDROME AND ASSOCIATED MORTALITY IN A POLYTRAUMA POPULATION

Karlijn J. Van Wessem* MD,Ph.D., Luke P. Leenen* MD,Ph.D., Department Of Trauma Surgery, University Medical Center Utrecht

Invited Discussant:

Introduction

The incidence of Adult Respiratory Distress Syndrome (ARDS) has decreased in the last decades by improvement in trauma and critical care. However, it still remains a major cause of morbidity and mortality. This study investigated the current incidence of ARDS and its relation to mortality in polytrauma patients.

Methods

A 4-year prospective study included consecutive trauma patients admitted to a Level-1 Trauma Center ICU. Isolated head injuries, drowning, asphyxiation and burns were excluded. Demographics, ISS, physiologic parameters, resuscitation parameters, Denver Multiple Organ Failure (MOF) scores and ARDS data according to Berlin criteria were prospectively collected. Only severe ARDS (PaO_2/FiO_2 ratio<100) was included in analysis. Data are presented as median (IQR), $p<0.05$ was considered significant.

Results

222 patients were included. Median age was 47 (28-60) years, 169 males (76%), ISS was 29 (22-37), 212 (95%) patients had blunt injuries. Forty-two patients (19%) died, 36 due to brain and/or spinal cord injuries (86%). Twenty-eight patients (13%) developed severe ARDS. Median time to ARDS onset was 2 (1-4) days after injury. Median duration of ARDS was 1 (1-2) day. Only 3 patients (11%) had ARDS for more than 3 consecutive days. No patient died of ARDS. Four patients who developed ARDS later died of CNS related injuries. Patients who developed ARDS had lower ISS (28 vs.29, p=0.04) lower PaO_2 in ED (182 vs. 223 mmHg, p=0.005), and lower saturation in ICU (97 vs. 98%, p=0.002). Further, they stayed longer on the ventilator (12 vs. 6 days, p=0.000), longer in ICU (16 vs.7 days, p=0.000) and in hospital (31 vs. 21 days, p=0.000) and developed more often Multiple Organ Dysfunction Syndrome (MODS 71% vs. 20%, p=0.000). There was however no difference in mortality between both groups (14% in ARDS vs. 20% in non-ARDS, p=0.61).

Conclusion

In this polytrauma population mortality was predominantly caused by brain injury. Although ARDS was still present in severely injured polytrauma patients, no patient died of ARDS. Its presentation was only early onset, and during a short time period.

PAPER 4 - WITHDRAWN

Session XVII: WTC III Session: Critical Care
Paper 5: 6:15am - 7:15am

STUDY OF SERUM COPPER LEVELS IN CONSERVATIVELY MANAGED HEAD INJURY PATIENTS WITH SPECIAL REFERENCE TO ITS SEVERITY AND OUTCOME.

VINOD JAIN MD, Samir Misra MD, Ankita Johary Ph.D., King George's Medical University

Introduction: Head injury is most common cause of death and disability in mechanically injured patients. Trace metals like copper is known to have its impact in traumatic brain injury. This study was conducted to observe impact of serum copper levels in traumatic brain injury and its correlation with severity and outcome.

Methods: It is a prospective cohort study. Blood samples were collected within eight hours of injury and serum copper was estimated by atomic absorption spectrophotometer after its complete digestion by microwave digester. Patients were subsequently followed up clinically with repeat serum copper estimation on day 5 and day 10. Levels in cases and controls as well as that in moderate and severe head injury patients on day 0, day 5 and day 10 were compared using paired t-test. The p-value<0.05 was considered as significant. All analysis was carried out by using SPSS 24.0 version.

Results: The results are presented in mean±sd. Serum copper levels were found to be significantly low in patients of severe head injury ($p<0.001$). Patients with persistent low levels of serum copper had poor recovery in GCS ($P<0.05$)

Conclusion: Study showed primary evidence of a relationship between severity and serum copper levels in traumatic brain injury patients. Association of persistent low level with poor outcome opens new area of research to study recovery pattern with additive therapy of copper in severe head injury patients.

WTC 15: Prevention **Sponsored by Eastern Association for the Surgery of Trauma (EAST)**

Location: Harbor C, Second Level (Harbor Tower)

Moderators: Jose Mauro da Silva Rodrigues, MD and Nicole Stassen, MD, Brazil and USA
Keynote: Nicole Stassen, MD, A New Frontier in Firearm Injury, USA

IMPACT OF THE RESUSCITATIVE ENDOVASCULAR BALLOON OCCLUSION OF THE AORTA (REBOA) ON MORTALITY IN PENETRATING TRAUMA PATIENTS: A PROPENSITY SCORE ANALYSIS
Alberto Garcia, MD, Colombia

INTERPERSONAL VIOLENCE AND MORTALITY IN PEACETIME SUB-SAHARAN AFRICA
Presenter: Brittney Williams, MD, USA

THE SPECTRUM OF INJURIES RESULTING FROM GUNSHOT WOUNDS IN CAR HIJACKING: A SOUTH AFRICAN EXPERIENCE
Presenter: Victor Kong, PhD, MBChB, South Africa

CORRELATION BETWEEN QUALITY AUDIT FILTERS AND SEVERITY OF TRAUMA
Presenter: Jose Parreira, MD, PhD, Brazil

MORBIDITY, MORTALITY AND HEALTHCARE COST DUE TO INJURY FROM VENOMOUS AND NON-VENOMOUS ANIMALS IN THE UNITED STATES: 5-YEAR ANALYSIS OF THE NATIONAL EMERGENCY DEPARTMENT SAMPLE
Presenter: Joseph Forrester, MD, MSc, USA

Session XVII: WTC III Session: Prevention
Paper 1: 6:15am - 7:15am

IMPACT OF THE RESUSCITATIVE ENDOVASCULAR BALLOON OCCLUSION OF THE AORTA (REBOA ON MORTALITY IN PENETRATING TRAUMA PATIENTS: A PROPENSITY SCORE ANALYSIS.

ALBERTO F. GARCIA MD, RAMIRO MANZANO MD, CLAUDIA P. ORLAS MD, ALVARO I. SANCHEZ MD,Ph.D., JUAN C. PUYANA MD, CARLOS A. ORDOÑEZ MD, Fundacion Valle del Lili

Introduction: The use of endovascular balloon occlusion of the aorta (REBOA) as an ancillary method in damage control resuscitation (DCR) for trauma has been reported mostly on blunt injuries. Information on penetrating trauma is limited and the effect on mortality is not known. We compared in-hospital mortality between penetrating trauma patients managed with and without REBOA, adjusted by a propensity score.

Methods: In a retrospective cohort study, patients 16 years or older with penetrating trauma, requiring DCR and emergent surgery, and treated between 2014 and 2017, were included. The decision to use or not REBOA during emergent surgery was based on individual surgeon opinion. A propensity score (PS) was built adjusting for age, clinical signs on admission (systolic blood pressure, cardiac rate, Glasgow coma scale), severe trauma in thorax and abdomen, and the presence of non-compressive torso hemorrhage. PS attempted to approximate the conditions of random assignation of REBOA for treatment, in patients who had a similar distribution of covariates. Main analysis compared mortality between patients with and without REBOA. Final logistic regression for mortality was adjusted for the number of red blood cells (RBC) transfused within the first six hours after admission, injury severity score (ISS), and quintiles of PS.

Results: Inclusion criteria were met by 345 patients; 28 of them (8.1%) were treated with REBOA. Crude mortality rates were 17.8% (5 patients) in REBOA group and 15.4% (49 patients) in control group (p=0.785). After controlling for RBC transfused, ISS, and PS, the odds of death in REBOA group was 78% lower than in the control group (odds ratio [OR] 0.22, 95% confidence interval [95%CI] 0.05-0.84, p=0.028). This regression model demonstrated excellent discrimination (area under the curve of 0.81) and adequate calibration (p=0.097).

Conclusion: After adjustment for an anatomic score (ISS), a physiologic indicator of blood loss (number of RBC transfused), and quintiles of PS, the use of REBOA showed a significant reduction in the odds of mortality, compared with no REBOA use. It suggests that, in selected penetrating trauma patients who are suffering severe injuries and physiologic exhaustion, the use of REBOA might add to the survival, as an adjuvant of DCR protocols.

Session XVII: WTC III Session: Prevention
Paper 2: 6:15am - 7:15am

INTERPERSONAL VIOLENCE AND MORTALITY IN PEACETIME SUB-SAHARAN AFRICA

Brittney M. Williams MD, Gift Mulima MBBS, Paula Strassle MSPH, Anthony Charles MD,MPH, Rebecca Maine MD,MPH, University of North Carolina

Introduction: Trauma is a leading cause of death and disability worldwide. Interpersonal violence has often been overlooked as a significant cause of traumatic injury and mortality. We hypothesized characteristics differed between victims of interpersonal violence and unintentional injuries in Sub-Saharan. We also sought to identify factors associated with mortality.

Methods: We compared characteristics of all injured patients in the trauma registry at Kamuzu Central Hospital, Lilongwe, Malawi, from 2009 through 2016. Multivariable Poisson regression was used to identify factors associated with inpatient mortality after interpersonal violence.

Results: Of 109,422 trauma patients, 26,829 (24.5%) were victims of interpersonal violence. Compared to unintentional injuries, alcohol was more frequently used by assault victims (15.7% vs 2.9%, p<0.001), women comprised fewer assault victims (20.7% vs 29.8%, p<0.001), and assaulted patients were older (median 27yrs vs 21yrs, p<0.001). Most assaults involved penetrating injuries (45.8%). In multivariable analysis, truncal injuries (iRR 7.14, 95%CI 3.74, 13.67) head injuries (iRR 4.36, 95%CI 2.41, 7.90), ≥3 injured body locations (iRR 2.54, 95%CI 1.71, 3.76), penetrating injuries (iRR 3.52, 95%CI 1.96, 6.34) and blunt tool injuries (iRR 2.27, 95%CI 1.23, 4.18) were associated with increased mortality (Table). For every increased decade of age, mortality risk increased by 17% (iRR 1.17, 95%CI 1.02, 1.33). Women had lower mortality (iRR 0.43, 95%CI 0.24, 0.78).

Conclusion: Even in peace times, interpersonal violence accounts for a large percentage of Malawi's trauma burden. Significant risk factors for mortality are penetrating and blunt tool injuries to the torso, thus improving surgical capacity is essential to reducing homicides.

Characteristics	Patients n (%)	iRR	95% CI	p-value
Extremity injury	7,178 (27)	ref	---	---
Head injury	15,153 (57)	**4.36**	**2.41 – 7.91**	**< 0.001**
Torso injury	4,248 (16)	**7.15**	**3.74 – 13.67**	**< 0.001**
1 injured body regions	15,606 (57)	ref	---	---
2 injured body regions	8,855 (33)	1.37	0.97 – 1.93	0.07
≥3 injured body regions	2,797 (10)	**2.54**	**1.71 – 3.76**	**< 0.001**
Punches and kicks	2,691 (21)	ref	---	---
Blunt tool	4,255 (33)	**2.27**	**1.22 – 4.18**	**0.009**
Penetrating tool	5,862 (46)	**3.53**	**1.96 – 6.34**	**< 0.001**

Session XVII: WTC III Session: Prevention
Paper 3: 6:15am - 7:15am

THE SPECTRUM OF INJURIES RESULTING FROM GUNSHOT WOUNDS IN CAR HIJACKING: A SOUTH AFRICAN EXPERIENCE

Victor Kong Ph.D., MBChB, Joanna M. Blodgett BSc, Ross Weale MBBS, BSc, John L. Bruce MBChB, Grant Laing Ph.D., MBChB, Damian Clarke Ph.D., MBChB
Pietermaritzburg Metropolitan Trauma Service, Department Of Surgery

Introduction: Car hijacking is aggravated robbery of a vehicle from the driver that usually involves the use of a firearm. South Africa has the highest rate in the world. However, there is little literature on the spectrum of GSW (gunshot wounds) sustained by victims of car hijacking.

Methods: A retrospective review was conducted over the 8-year period from January 2010 to January 2018 at a Major Trauma Centre in South Africa. All patients who sustained GSW following a carjacking incident were included.

Results: 101 patients were identified (74% male, mean age: 34 years). The mean time from injury to arrival was 7 hrs (rural district: 10 hrs, urban district, 4 hrs, $p < 0.001$). Seventy-five percent (75/101) of all patients sustained GSW to multiple body regions, while the remaining 25% (25/101) were confined to a single body region. The most common region involved was the chest (48) followed by the abdomen (46) and neck (34). 62% of patients required one or more operative intervention. The most common procedure was laparotomy (28), followed by peripheral vascular exploration (20) and neck (14) exploration. Eighteen percent require intensive care admission, the mean length of hospital stay was 8 days. The overall morbidity was 13% (16/101) and the overall mortality was 18% (18/101).

Conclusion: The majority of victims sustained multi-regional GSWs and two-third require surgery, with a high mortality. Trans-axial GSW of the torso is common and can be challenging to manage.

Session XVII: WTC III Session: Prevention
Paper 4: 6:15am - 7:15am

CORRELATION BETWEEN QUALITY AUDIT FILTERS AND SEVERITY OF TRAUMA

Jose G. Parreira MD,Ph.D., Luisa C. Higa Samuel B. Melin Thalia Polgrossi Jacqueline G. Perlingeiro MD,Ph.D., Tercio De Campos MD,Ph.D., Jose C. Assef MD,Ph.D.,
SANTA CASA SCHOOL OF MEDICAL SCIENCES

Introduction: trauma is a frequent problem, which often requires prompt diagnosis and treatment. The stress and the complexity present in some cases create a situation in which errors are more likely to occur. Trauma audit filters were proposed as variables able to identify opportunities to improve patient's care. However, the role of audit filters as adequate tools for quality improvement programs has been recently questioned. The objective of this study was to assess the correlation between the most frequently used audit filters (AF) and the severity of trauma.

Methods: We carried out a retrospective analysis of the trauma registry data, including adult patients admitted from 2014 to 2015. Severity of the trauma was assessed by *Abbreviated Injury Scale* (AIS), *Revised Trauma Score* (RTS), *Injury Severity Score* (ISS) e TRISS. We selected ten AF frequently used in quality improvement programs: F1: Acute subdural hematoma drained after 4 hs. of admission. F2: transfer a patient with GCS<8 without a definitive airway. F3: tracheal reintubation <48 hs. of planned extubation. F4: time between admission and laparotomy > 60 min. in unstable patients. F5: unplanned reoperation. F6: laparotomy after 4 hs. of admission. F7: no fixation of femur diaphysis fracture. F8: nonoperative management of abdominal GSW. F9: time between admission and operative treatment of open tibial fracture greater than 6 hs. F10: operation after 24hs. of admission. We compared trauma indexes between patients with and without AF. We used chi-square and Fisher's exact tests, considering $p<0.05$ as significant.

Results: 663 patients were included, with mean age of 39 ± 9 years. Mean RTS, ISS and TRISS were, respectively, 6.7 ± 1.4; 6.8 ± 11.3 e 0.90 ± 0.20. AF were present in 39 patients (5.9%), including 10 of the 498 patients with ISS<10 (2.0%), 3 of the 26 with ISS between 10 and 15 (11.5%), 14 of the 63 with ISS between 16 and 25 (16.9%) and 12 of the 43 with ISS>25 (27.9%) ($p<0.05$). In patients sustaining severe injuries in head, thorax, abdomen and extremities, AF were, respectively, 21, 16, 17 and 9 times more frequent.

Conclusion: These data show a correlation between AF and trauma severity. This might indicate that the more severe is the trauma, the higher is the risk for mistakes.

Session XVII: WTC III Session: Prevention
Paper 5: 6:15am - 7:15am

MORBIDITY, MORTALITY AND HEALTHCARE COST DUE TO INJURY FROM VENOMOUS AND NON-VENOMOUS ANIMALS IN THE UNITED STATES: 5-YEAR ANALYSIS OF THE NATIONAL EMERGENCY DEPARTMENT SAMPLE

Joseph D. Forrester MD, MSc, Jared A. Forrester MD, Lakshika Tennakoon MPhil, Kristan Staudenmayer* MD, MS Stanford University

Introduction: Injuries due to encounters with animals can be serious, but are often discussed anecdotally or only for isolated types of encounters. The burden of animal-related injuries is currently unexplored. We sought to characterize animal-related injuries on U.S. emergency departments (ED) to determine the impact of these types of injuries.

Methods: All ED encounters with the diagnosis code corresponding to an animal-related injury were identified using ICD-9-CM codes from the 2010-2014 National Emergency Department Sample (NEDS). The primary outcome was mortality; secondary outcomes included costs and inpatient admission. Survey methodology was applied to univariate and multivariate analyses. Weighted numbers are presented.

Results: A total of 6,457,534 ED visits resulting from animal-related injuries were identified, averaging 1,291,507 visits annually. This corresponded to 19 animal-related injuries per 10,000 patient-ED visits per year. Common animal-related injuries were associated with bites from non-venomous arthropods (n=2,648,880; 41%), followed by dogs (n=1,660,878; 26%), and envenomation from hornets, wasps or bees (n=813,649; 13%). A total of 210,516 patients (3%) were admitted. Inpatient admission was the most common for those who sustained bites from venomous snakes or lizards (24%, N=10,332). Death was infrequent, occurring in 1,162 patients (0.02% of all ED presentations). The greatest number of deaths were due to bites from non-venomous arthropods (24% of deaths, n=278). Rat bites proved the most lethal (6.5 deaths per 10,000 bites), followed by bites from venomous snakes or lizards (6.4 deaths per 10,000 bites). Dog bites resulted in fatality 6.1 times in 10,000 bites. Factors associated with increasing odds of death were age>65 years (OR 7.0, P<0.001) and ISS>15 (OR 39.9, P<0.001); female sex was associated with decreased odds of death (OR 0.6, P<0.001). Total healthcare cost due to animal encounters was 5.7 billion dollars (95% confidence interval: 5.4-6.5 billion dollars) over the 5-year time period.

Conclusion: The morbidity, mortality, and healthcare cost due to animal encounters in the United States is considerable. Often overlooked, this particular mechanism of injury warrants further public health prevention efforts.

WTC 16: Abdominal Trauma **Sponsored by European Society for Trauma and Emergency Surgery (ESTES)**

Location: Seaport A-C, Second Level (Seaport Tower)

Moderators: Jungchul Kim, MD and Ari Leppaniemi, MD, PhD, South Korea and Finland
Keynote: Ari Leppaniemi, MD, PhD, Nonoperative Management of Solid Abdominal Organ Injuries

DIAGNOSIS AND TREATMENT OF BLUNT ADRENAL GLAND TRAUMA
Presenter: Alexander Smolyar, PhD, Russia

DAMAGE CONTROL INDICATION FOR SEVERE BLUNT TRAUMA INJURIES IN JAPAN
Presenter: Nao Urushibata, MD, Japan

OUTCOMES OF BLUNT ABDOMINAL TRAUMA PATIENTS WITH A FALSE-NEGATIVE FAST SCANNING IN A LEVEL I TRAUMA CENTER
Presenter: Ibrahim Yilmaz, MD, USA

HOLLOW VISCOUS ORGAN INJURY IN BLUNT ABDOMINAL TRAUMA- CHALLENGES IN TRAUMA BAY
Presenter: Samir Misra, MD, India

EVALUATION OF THE SELECTIVE USE OF CONTRAST-ENHANCED COMPUTED TOMOGRAPHY IN CLOSED ABDOMINAL TRAUMA
Presenter: Heitor Consani, MD, Brazil

Session XVII: WTC III Session: Abdominal Trauma
Paper 1: 6:15am - 7:15am

DIAGNOSIS AND TREATMENT OF BLUNT ADRENAL GLAND TRAUMA

Alexander Smolyar Ph.D., Domodedovo City Hospital

Introduction: Frequency of blunt adrenal gland injury (AGI) is less than 1%.

Methods: 32 patients with AGI were included in a prospective study. There were 26 men (81.3%) and 6 women (18.7%) 30±12.9 years old with ISS of 22.7±13.6. 28 (87.5%) were delivered to the hospital through 1.3±1 hour after injury, 4 (12.5%) were transferred from10 till 96 hours. All patients performed FAST during resuscitation. Intensive bleeding from liver or spleen in 10 patients were the indication for urgent laparotomy. One patient performed left thoracotomy and then laparotomy. One of the four transferred performed laparotomy at Level 2 trauma center. Thus 12 victims (37.5%) performed urgent laparotomy, 20 (62.5%) were treated without operation. US of the abdominal cavity and the abdominal CT with intravenous contrast enhancement were performed. In case of conservative treatment US and CT have been repeated.

Results: Thirty victims were found to have right AGI, 1 - left and 1 - both. The V degree of AGI was found in 30 victims, IV and III – in one. Most often, the right kidney (10), liver and right kidney (5), liver (3) were damaged with the adrenal gland. AGI hadn't any clinical picture and was found only during US or CT. No one AGI was identified during laparotomy. AGI was found by US in 27 victims (84.4%). Direct US sign was the appearance of oval hypoechoic mass with a clear border and size less than 50x40 mm without blood flow. AGI suggested when injury of right kidney, liver segment VII and right perirenal hematoma were identified. The more indirect signs had been found, the more likely AGI was. The accuracy of US diagnosis of AGI increased with repeated trials a day from the time of injury. An important difference of AGI from tumor was gradual regression of US signs and return to a normal picture in the fourth week. AGI was found by CT in 31 patients (96.9%). An oval high density mass with clear borders less than 57x31 mm was found. On the 3rd day the gland became heterogeneous due to the appearance of low-density areas. By the 14th day adrenal gland density became normal. Only the absence of contrast medium accumulation allowed to recognise AGI from tumor. The AGI size decreased from the third week and the structure and size became normal to 1.5-2 months. Bleeding from the adrenal gland in all cases stopped spontaneously. Clinical manifestations of adrenal insufficiency wasn't observed. Thirty one victims recovered, one died from severe traumatic brain injury.

Conclusion: Blunt adrenal gland injury had no characteristic clinical picture, however, clearly revealed by US and CT. Conservative therapy was effective in all cases.

Session XVII: WTC III Session: Abdominal Trauma Paper 2:
6:15am - 7:15am

Damage Control Indication for Severe Blunt Trauma Injuries in Japan

Nao Urushibata MD, Kiyoshi Murata Ph.D., Raira Nakamoto MD, Ayako Yoshiyuki MD,
Matsudo City General Hospital

Introduction: There are many arguments regarding the criteria for damage control surgery(DCS). Previously, we analyzed the data from Japan Trauma Data Bank (JTDB) and created a score for damage control surgery (Damage Control Indication Detecting score; DECIDE score), comprised of body temperature, Glasgow Coma Scale(GCS) and type of injury (blunt or penetrating). Considering trauma in Japan is mostly blunt injuries, as gun-shot wounds are seldom in Japan, we sought for a new criterion for DCS focusing on blunt injuries.

Methods: Retrospective data from JTDB from 2004-2014 were used to analyze blunt trauma patients who were FAST positive and underwent emergency laparotomy. We excluded burn victim patients and patients with ISS=75. Primarily, we performed a baseline characteristic analysis between the DCS group and non-DCS group. Then, we performed a logistic regression analysis and created a prediction score for damage control surgery.

Results: Of the 159157 registered trauma patients, 1934 blunt trauma patients who were FAST positive and underwent emergency laparotomy were extracted. We compared the 364 patients that underwent DCS (DCS group) to the 1570 patients who underwent typical laparotomy (non-DCS group). Blood pressure, body temperature, GCS, blood transfusion rate, Injury Severity Score, time to surgery, and mortality rate were significantly different between the groups. Then, we performed a logistic regression analysis, with DCS as the dependent variable, and age, gender, head AIS, ISS, GCS, body temperature, and blood pressure as the independent variables. Blood pressure, GCS, and body temperature were independent risk factors for DCS. Following the analysis, we categorized the risk variables, and created the DCS prediction score comprised of body temperature (0-2 points), blood pressure (0-1 point) and Glasgow Coma Scale (0-3 points) with a maximum of six points. From this score, we performed a receiver operating characteristic (ROC) analysis. Area under the ROC curve was 0.704, and cut-off value of three points showed sensitivity of 68% and specificity of 63%. Furthermore, we used the data from JTDB 2015 to validate our score. The proposed score showed legitimate sensitivity and specificity for Damage Control Surgery as well as mortality.

Conclusion:Blood pressure, body temperature, and GCS could be utilized as a legitimate indicator for damage control surgery in Japan.

Session XVII: WTC III Session: Abdominal Trauma
Paper 3: 6:15am - 7:15am

OUTCOMES OF BLUNT ABDOMINAL TRAUMA PATIENTS WITH A FALSE-NEGATIVE FAST SCANNING IN A LEVEL I TRAUMA CENTER

Ibrahim Yilmaz MD, Mehmet Saydam MD, Paige E. Finkelstein BS, Omar Picado MD,MPH, University Of Miami, Jackson Memorial Hospital

Introduction: Focused assessment with sonography for trauma (FAST), is the initial diagnostic modality of choice for the assessment of blunt abdominal trauma and was adopted in the Advanced Trauma Life Support (ATLS) protocol by American College of Surgeons. Despite widespread use, there are ongoing debates regarding the accuracy of FAST and the interpretation of false-negative results. Here we determine whether negative FAST studies can rule out abdominal injuries.

Methods: A retrospective study was carried out between October 2008 and October 2013 on 11,924 patients admitted to our Level I Trauma Center who received a FAST examination. Free fluid in RUQ, LUQ or pelvis was considered "positive FAST." Abdominal CT and/or exploratory laparotomy were considered gold standard confirmation of free fluid. True positive (TP) FAST was defined as positive FAST and presence of free fluid with abdominal CT or surgery. False negative (FN) FAST was absence of free fluid with FAST but presence of free fluid found during abdominal CT or surgery. Multivariable modeling was used to compare TP and FN FAST results and outcomes of FN FAST patients.

Results: The study population comprised 9973 patients that sustained blunt abdominal trauma, the majority of them being male (72.4%). Mean age was 38.5 years, median hospital LOS was 9.52 days, injury severity score (ISS) was 11.9 and 7,767 (79.47%) cases were discharged home without any sequela. FAST positive (+), FAST negative (-), and FAST undetermined were; 358 (3.6%), 9172 (93.8%) and 242 (2.47%), respectively. FN FAST was 312 (3.4%) of total FAST (-) patients, and TP FAST group was 319 (89.1%) of total FAST (+) patients. Sensitivity was 50.55% (95% CI [46.58%-54.52%]) and specificity was 99.56% (95% CI [99.40%-99.69%]). True LOS was increased for FN FAST by a factor of 2 ($p<0.0001$), but hospital LOS, ICU days, morbidity, and discharge status were similar between TP and FN.

Conclusion: FAST has a low sensitivity (50.5%) for evaluation of blunt abdominal trauma, and FN FAST results in prolonged LOS due to additional imaging methods and/or serial abdominal examinations. Although FAST (+) predicts abdominal injury, FAST (-) does not exclude abdominal injury.

Session XVII: WTC III Session: Abdominal Trauma
Paper 4: 6:15am - 7:15am

HOLLOW VISCOUS ORGAN INJURY IN BLUNT ABDOMINAL TRAUMA-CHALLENGES IN TRAUMA BAY

Samir Misra MD, Yadvendra Dheer MD, Sandeep Tiwari MD, Vaibhav Jaiswal MD,
King George's Medical University

Introduction: Trauma is fast becoming the leading cause of mortality and morbidity in the young population of the globe. Amongst all the causes of trauma like road traffic incidence, falls and penetrating injuries, trauma surgeons tend to broadly categorize trauma in two broad categories – blunt injuries and penetrating injuries. Most of the victims, who suffer from multiple injuries, experience both types of mechanism of injury and land up in the trauma bay. But by far, blunt injuries are more common than penetrating forces. Blunt injury abdomen are challenging in both, presentation and management. It is also quite challenging to understand and reconstruct the event in reference to the mechanism of injury to predict intraabdominal injuries.

Methods: Total 824 patients with blunt injury abdomen were admitted to the department of trauma surgery, KGMU, UP, Lucknow, India. A retrospective observational study was conducted in regard to the mechanism of injury, presentation and operative findings.

Results: 326 patients were managed by surgical intervention and 499 patients by nonoperative measures. Out of 326 patients, who landed in OR, 96 patients of solid visceral organ injuries were treated. 227 patients presented with hollow visceral injuries and only 128 patients required early operative management. 99 patients with blunt abdominal trauma presented late, either in our department or were transferred from other hospitals.

Conclusion: We studied the basic mechanism of injuries and presentation of the patients, and concluded that hollow viscous injuries may delay in presentation, symptomatically. We called this delay as the lucid interval of presentation. The varied mechanism involved in blunt abdominal trauma may obstruct the reconstruction of events. These may masquerade or even hide symptom of intra-abdominal injuries, which may present late. Patients may attend the trauma bay late and even land up in shock, which becomes challenging to manage. The overuse of antibiotics and analgesics may keep an operative patient out of OR and initial protocol management may tilt towards non-operative management. Late bowel perforations and mesenteric tear leading to gangrene of bowel segments may delay symptomatic presentation. Injuries to urinary bladder, gall bladder, previously undetected ovarian cyst, mesenteric cyst, and gravid uterus etc may present late in course of blunt abdominal trauma, and a high index of suspicion and serial clinical and radiological examination are the keys for successful management of these patients. The patients who presented late had a prolonged hospital stay and high incidence of morbidity and mortality.

Session XVII: WTC III Session: Abdominal Trauma
Paper 5: 6:15am - 7:15am

EVALUATION OF THE SELECTIVE USE OF CONTRAST-ENHANCED COMPUTED TOMOGRAPHY IN CLOSED ABDOMINAL TRAUMA

Heitor F. Consani MD, Yasmine Rebecchi CONJUNTO HOSPITALAR DE SOROCABA

In order to reduce the dose of radiation and contrast-induced nephropathy, we suggest the use of contrast-free Computer Tomography (CT) as the initial evaluation form, and selective indication of intravenous (iv) and oral contrast.

We retrospectively evaluated 86 exams of patients attended in the ER with a history of closed abdominal trauma who underwent tomography in the current protocol, noncontrast phase, phase with iv contrast and late phase.

We evaluated the noncontrast phase of these exams and then suggested the use of contrast, so that we could evaluate all CTs in the following phases.
As a result we had 86 exams, 12(14%) which had indication to use contrast ev and 8(0,09%) to use oral contrast (6 (0,07%) had indication to ev and oral contrast). The main doubt in these exams was hollow viscera lesion and pancreatic lesions.
Of the 76(88%) CT scans that did not require contrast, only one presented a discrepant diagnosis, however did not compromise the patient's clinical follow-up.

The emergency CT plays an important role in the assessment of blunt abdominal trauma, despite the need for prospective multicenter and randomized studies, in this retrospective study with protocol of evaluation using contrast selectively, the evaluation without contrast presented a great result, and safety. Although CTs with contrast can facilitate the representation of lesions of solid and hollow viscera, CTs without contrast can detect serious lesions effectively, also reducing radiation and possible complications of intravenous contrast.

WTC 17: Guidelines/Outcomes **Sponsored by European Society for Trauma and Emergency Surgery (ESTES)**

Location: Coronado DE, Fourth Level (Harbor Tower)

Moderators: Yoshinori Murao, MD and Radko Komadina, MD, Japan and Slovenia
Keynote: Radko Komadina, MD, European Bleeding Guidelines

DETERMINANTS OF EMERGENCY DEPARTMENT DISCHARGE DISPOSITION OF PATIENTS WITH TRAUMATIC BRAIN INJURY IN A TERIARY CARE HOSPITAL OF UGANDA
Presenter: Amber Mehmood, MD, MPH, USA

ROUTINE SERIAL CT OF THE HEAD AND HOURLY NEUROLOGIC EXAMINATIONS ARE UNNECESSARY IN PATIENTS WITH MINOR TRAUMATIC BRAIN INJURY
Presenter: Kira Smith, MD, MS, USA

DEVELOPMENT OF A PSEUDO ENCRYPTION TOOL TO SHARE UNIQUE PATIENT IDENTIFIERS BETWEEN INSTITUTIONS TO FACILITATE TRAUMA/EMERGENCY MEDICINE EPIDEMIOLOGIC RESEARCH WITHIN METRO REGION
Presenter: Michaela West, MD, PhD, USA

A COMPARATIVE ANALYSIS OF THE FINDINGS OF POST-MORTEM CT SCAN AND TRADITIONAL AUTOPSY IN TRAUMATIC DEATHS: IS TECHNOLOGY MUTUALLY COMPLEMENTING OR EXCLUSIVE?
Presenter: Biplab Mishra, MS, India

TUBE THORACOSTOMY FOR THE TRAUMA PATIENT; IT'S NOT JUST ABOUT SIZE
Presenter: John Agapian, MD, USA

Session XVII: WTC III Session: Guidelines/Outcomes
Paper 1: 6:15am - 7:15am

DETERMINANTS OF EMERGENCY DEPARTMENT DISCHARGE DISPOSITION OF PATIENTS WITH TRAUMATIC BRAIN INJURY IN A TERTIARY CARE HOSPITAL OF UGANDA

Amber Mehmood MD,MPH, Nukhba Zia MD,MPH, Rukia Namaganda MPH, Hussein Ssenyonjo MD, John Mukasa MD, Joel Kiryabwire MD, Michael Muhumuza MD, Adnan A. Hyder MD,MPH,Ph.D., Olive Kobusingye MD,MPH, Johns Hopkins Bloomberg School Of Public Health, USA/ Makerere University School Of Public Health And Mulago Hospital, Uganda

Introduction: Traumatic brain injuries (TBI) are common causes of emergency department visits and hospital admissions due to trauma in Kampala, Uganda. Patients with different causes of TBI have different clinical presentation and severity of injury. The objective of this study was to determine the predictors of Emergency Department (ED) discharge disposition with reference to patient and injury characteristics. The outcome consists of four categories: Discharged home, Admitted, Died, and Others including referred or went against medical advice.

Methods: This prospective study was conducted at Mulago National Referral Hospital, Kampala, Uganda from May 2016-July 2017. Patients of all age groups presenting to ED with TBI were followed-up till ED disposition or within 24 hours of ED arrival, whichever comes first. Patient demographics, external causes of injury, TBI characteristics, injury severity (Kampala trauma score: KTS; Revised trauma score: RTS) and discharge disposition from ED was noted. TBI cases were grouped into mild, moderate and severe categories based on Glasgow Coma Scale (GCS). We used multinomial logistic regression model to calculate conditional odds ratio of admission, death and other disposition compared to discharged home as a reference category.

Results: There were 3,944 patients were included in the study. Proportion of males was 84.7% and that of females was 15.3%. Mean age was 28.50 (SD:14.22). Patients had closed head injury in 62.9% cases and open head injury in another 36.3% The cause of TBI was road traffic injury in 58.8% cases, and intentional injuries in 28.7% cases. There was no significant difference between four discharge categories with respect to age, sex, mode of arrival, cause of TBI, area of residence, place of injury, type of head injury, and RTS ($p^3 0.05$), but there were statistically significant differences ($p< 0.05$) between four discharge categories for number of serious injuries, GCS on arrival, change in GCS, and KTS. In multinomial logistic regression model, after adjusting for other variables—type of head injury, GCS on arrival, KTS and change in GCS were significant predictors for admission and death in ED, whereas mode of arrival, improvement in GCS, and KTS were significant predictors in others category including referred or left against medical advice.

Conclusion: The conditional odds ratios for Emergency department disposition are differentially affected by injury characteristics and are largely dependent on KTS, and change in Glasgow Coma Scale during ED stay. TBI patient characteristics have no impact on ED disposition in a tertiary care hospital of Kampala.

Session XVII: WTC III Session: Guidelines/Outcomes
Paper 2: 6:15am - 7:15am

ROUTINE SERIAL CT OF THE HEAD AND HOURLY NEUROLOGIC EXAMINATIONS ARE UNNECESSARY IN PATIENTS WITH MINOR TRAUMATIC BRAIN INJURY

Kira E. Smith MD, MS, Lauren E. Mount MD, Edwin Rosendo BS, Nicole E. Leahy MPH,RN, Phillip S. Barie* MBA,MD, Mayur Narayan* MBA,MD,MPH, Anton G. Kelly MD, Jian Shou MD, Robert J. Winchell* MD, Weill Cornell Medicine

Introduction: The clinical presentation of mild traumatic brain injury (TBI), defined as initial GCS > 13, is frequent in patients presenting with blunt trauma, and is often evaluated by computed tomography of the head (CTH). Positive findings on CTH can trigger a cascade of events including serial CTH, monitoring in an ICU setting, and prolonged hospitalization, all intended to identify patients that might require neurosurgical intervention, although the frequency of such intervention is low. We hypothesize that positive findings on CTH in patients with GCS > 13 portend minimal risk, and that serial CTH and ICU-level monitoring are unnecessary, adding substantial cost of care without benefit.

Methods: We reviewed all adult trauma patients (age > 17 years) admitted to a single urban level I trauma center between 1/1/2016 and 12/31/16. Patients with an ICD10 code for traumatic subarachnoid hemorrhage (SAH: chosen as a marker for positive CTH) and initial GCS > 13 were identified as the study group, and medical records were reviewed. Data collected included age, sex, mechanism of injury, admission GCS score, length of stay and discharge disposition. Timing and results of CTH studies, serial evaluations of GCS, and need for neurosurgical intervention were also collected.

Results: The study group consisted of 135 patients, who underwent a total of 311 CTH. 24 patients had one CTH, 63 patients had 2, 35 patients had 3 and 13 patients ≥ 4 CTH. Average ICU length of stay was 2.4 days for patients having 1 or 2 CTH, and 5.6 days for those having more than 2 CTH. Four patients (3%) required craniotomy, all of whom had either epidural hematoma (EDH) or subdural hematoma (SDH) in addition to SAH. One craniotomy was done immediately for a large EDH, and the other 3 were done in delayed fashion for acute-on-chronic SDH. No patient had specific intervention driven by findings on serial CTH, nor did any patient have specific intervention driven by clinical neurologic deterioration over the course of a single hour.

Conclusion: In our study population of patients with GCS > 13 and positive CTH, as identified by the presence of traumatic SAH, neurosurgical intervention was required in only 3%, all of whom had large EDH or SDH identified on the initial CTH. No specific interventions were driven by findings on serial CTH, or by changes in GCS over the course of a single hour. These findings demonstrate that more than 170 repeat CTH yielded no actionable findings, and could have been avoided. Furthermore, patients the study group utilized a total of more than 450 ICU days, at a cost more than double that of care in the step-down unit. Based on our data, patients with presenting GCS > 13 and positive CTH do not require routine serial CTH or routine admission to the ICU. Adoption of this approach will result in substantial savings while maintaining quality care.

Session XVII: WTC III Session: Guidelines/Outcomes
Paper 3: 6:15am - 7:15am

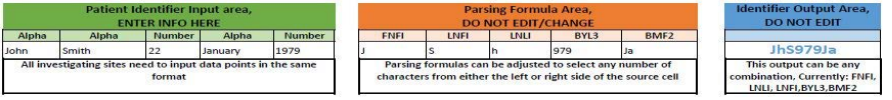
Development of a Pseudo Encryption Tool to Share Unique Patient Identifiers Between Institutions to Facilitate Trauma/Emergency Medicine Epidemiologic Research Within Metro Region

Michaela A. West MD,Ph.D., John Lyng MD, Rachle Nygaard Ph.D., Patty Reicks RN, Barb Curran MA, Jonathan Gipson MD, North Memorial Health Care

Introduction: Local and national safeguards limit sharing of personal health information (PHI), to protect patient privacy. We encountered challenges in attempting to study recidivism of penetrating trauma across an urban metropolitan area secondary to HIPPA and state privacy laws. We sought to develop an IRB-approved mechanism whereby different trauma centers could identify patients who received care at more than one metro area trauma center.

Methods: An Excel formula was developed to create a unique identifier for each subject. This identifier had to be sufficiently specific to avoid duplication, incorporate alphanumeric data, be configurable at each site, and provide a de-encryption pathway. The Excel file stipulated columns for name (last, first, MI) and date of birth (month, dd, yyyy). Parsing functions were used to extract one or more characters from each column. The parsed alphanumeric terms were compiled into a shared "encrypted identifier".

Results: The Figure shows an example of a sample input: John Smith, 22 Jan 1979 (First, Last, Day, Month, Year) is transformed and compiled into the unique identifier JhS018Ja. Additional elements could be added to improve specificity or further obfuscate the identity. The approach was reviewed and approved by the IRB at all institutions and by corporate compliance officers.



Patient Identifier Input area, ENTER INFO HERE				
Alpha	Alpha	Number	Alpha	Number
John	Smith	22	January	1979
All investigating sites need to input data points in the same format				

Parsing Formula Area, DO NOT EDIT/CHANGE				
FNFI	LNFI	LNLI	BYL3	BMF2
J	S	h	979	Ja
Parsing formulas can be adjusted to select any number of characters from either the left or right side of the source cell				

Identifier Output Area, DO NOT EDIT
JhS979Ja
This output can be any combination, Currently: FNFI, LNLI, LNFI,BYL3,BMF2

Conclusion: A simple, spreadsheet based algorithm was developed to allow disparate trauma centers to share unique anonymous patient identifiers that allowed us to expand the scope of trauma research across health care systems to more completely understand injury within the entire metro area. Such a tool will help to facilitate trauma epidemiologic studies.

Session XVII: WTC III Session: Guidelines/Outcomes
Paper 4: 6:15am - 7:15am

A COMPARATIVE ANALYSIS OF THE FINDINGS OF POST-MORTEM CT SCAN AND TRADITIONAL AUTOPSY IN TRAUMATIC DEATHS: IS TECHNOLOGY MUTUALLY COMPLEMENTING OR EXCLUSIVE?

Biplab Mishra MS, Mohit K. Joshi MS, Sanjeev Lalwani MD, Adarsh Kumar MD, Atin Kumar MD, Subodh Kumar MS, Amit Gupta MS, Sushma Sagar MS, Amulya Rattan MS All India Institute Of Medical Sciences

Background: Postmortem examination is indispensable to ascertain the cause of an unnatural death. The increasing use of modern-day radiology for postmortem examination has opened a new arena in overcoming the difficulties of traditional autopsy. There are conflicting reports regarding superiority of one modality of the postmortem over other.

Objective: To compare the findings of postmortem CT scan and traditional autopsy in the victims of traumatic deaths and to analyze whether postmortem CT can be used to replace traditional autopsy.

Methods: All patients with history of trauma that were declared dead on arrival in Emergency Department were subjected to full body CT scan. An experienced Radiologist reported the findings of CT scan. Subsequently a forensic expert subjected the patients to traditional autopsy. The physician who performed autopsy was blinded to the findings of CT scan and vice versa. An individual who was not part of the Radiology or Forensic team entered the findings of CT scan and autopsy in a pre-designed Performa. An unbiased assessor finally compared the findings of the two modalities and analyzed the results. McNemar test was used to ascertain the level of significance between the findings reported by the two modalities considering p value of 0.05 as significant. The agreement or disagreement on cause of death reported by the two modalities was also assessed.

Results: 95% of the deceased were males. The mean age was 35 yrs. CT was superior in picking up bony injuries, air containing lesions, hemothorax and hemoperitoneum. Autopsy was more sensitive for soft tissue and solid visceral injuries. Both modalities were equally helpful in identifying extremity fractures. There was no statistically significant agreement on cause of death by both modalities.

Conclusion: Postmortem CT scan is promising in reporting injuries in traumatic deaths and can significantly complement the conventional autopsy. However, at present it cannot be considered as a replacement for traditional autopsy.

Session XVII: WTC III Session: Guidelines/Outcomes
Paper 5: 6:15am - 7:15am

TUBE THORACOSTOMY FOR THE TRAUMA PATIENT; IT'S NOT JUST ABOUT SIZE

John V. Agapian* MD, FACS, FCCM, Sean Satey MD, Peter Edpao MD, Juan Ortiz MD, Bron J. Finkelstein BS, David J. Eng BS, Anika Singh MD, Sydney Johnson MD, Daniel Ludi* MD, FACS, Arnold Tabuenca MD, FACS, Afshin Molkara MD, FACS University Of California, Riverside/RUHS; LLU

Introduction: Recent studies have challenged the dogma of using large chest tubes for trauma, and the 10th edition of ATLS is *now* even suggesting against this practice. However, none of these studies have accounted for the *suction power* used in the context of tube size; and, their conclusions have focused only on long term outcomes, and not on the *immediate* considerations that may determine if the patient will live or if they will die *(i.e.<24hour mortality was excluded from these early studies)* . The most decisive decision for the trauma surgeon to make under these conditions is whether a thoracotomy is indicated or not, and is based on whether the initial chest tube output/flow rate is higher than 20mL/kg or >200mL/hr for 4 consecutive hours. This standard of care was established using flow rates from *large* tube thoracostomies connected to a pleurovac set at -20cm H20 (14.7mmHg). Our hypothesis is that variation of suction power may affect the flow rate, and that this deviation from established standards may have significant therapeutic ramifications.

Methods: Flow rates of a uniform volume of solution (200mL water) were measured using different size thoracostomy tubes (10F, 20F, 40F) and different suction powers (200mmHg, 100mmHg, 40mmHg, 20mmHg).

Results: SD:200mmHg-->14.77100mmHg-->23.48 40mmHg-->42.09 20mmHg-->68.01 Tube Size mmHg mL/Sec

PRESSURE (mm/Hg)	TUBE SIZE (F)	FLOW RATE (mL/Sec)	
200	10	13.54	SD=9.62
	20	30.19	
	40	52.63	
100	10	8.52	SD=9.88
	20	20.88	
	40	28.05	
40	10	4.75	SD=13.33
	20	14.45	
	40	17.94	
20	10	2.97	SD=4.71
	20	9.31	
	40	12.17	

Conclusion: In all cases, the entire study volume of solution was *eventually* evacuated irrespective of tube size or suction power; *this finding is in line with earlier studies that showed no difference in tube size with respect to long term outcomes (ie. retained hemothorax for incomplete evacuation).* On the other hand though, the variation in flow rates between different size tubes changes significantly, with increasing suction power; suction power is a variable that has not been accounted for by any of the earlier studies. This variation is particularly important at the suction power that mimics a conventional pleurovac (-20mmH_2O/14.7mmHg).Timing, and indication for a thoracotomy can be dramatically affected by this variation in flow rate. Moreover, slower flow rates may lead to increase viscosity of solution (hemothorax forming clot), a factor not specifically addressed by our study. To this end, we advocate reserving caution moving away from time honored dogma of using large chest tubes for the trauma patient.

WTC 18: Education **Sponsored by SBAIT - Brazil Trauma Society**

Location: Harbor B, Second Level (Harbor Tower)

Moderators: Mamta Swaroop, MD and Gustavo Fraga, MD, PhD, USA and Brazil
Keynote: Gustavo Fraga, MD, PhD, Trauma Leagues: A Novel Option to Attract Medical Students to a Surgical Career

THE TEAM (TRAUMA EVALUATION AND MANAGEMENT) COURSE - MEDICAL STUDENT KNOWLEDGE GAINS AND RETENTION IN THE USA VS GHANA
Presenter: Allison Berndtson, MD, USA

VARIED TRAINING EXPERIENCE AMONG 2-YEAR FELLOWSHIP CANDIDATES: EXPERIENCE MAY NOT EQUATE TO SELF-PERCIEVED COMPETENCE
Presenter: Richard Maduka, BS, USA

COGNITIVE AND TEAM WORK RESUSCITATION SKILLS PERFORMANCE OF MEDICAL STUDENTS WITH THE TEAM® COURSE
Presenter: Maria Jimenez, MD, Colombia

THE IMPACT OF INTERNATIONAL TRAUMA ROTATION AT TYGERBERG HOSPITAL IN SOUTH AFRICA; COMPARISON OF SURGICAL VOLUME IN AN URBAN TRAUMA CENTER IN TOKYO
Presenter: Tsuyoshi Nagao, MD, Japan

ATLS 20 YEARS - FROM HONG KONG TO MAINLAND CHINA
Presenter: GUIXI ZHANG, BS, MBBS MHSM MTS, Hong Kong

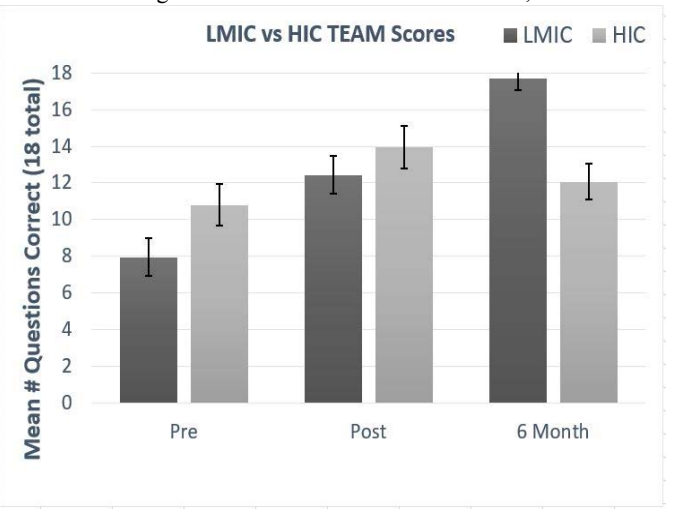
Session XVII: WTC III Session: Education
Paper 1: 6:15am - 7:15am

THE TEAM (TRAUMA EVALUATION AND MANAGEMENT COURSE - MEDICAL STUDENT KNOWLEDGE GAINS AND RETENTION IN THE USA VS GHANA

Allison E. Berndtson MD, Martin T. Morna MB ChB, Samuel Debrah MB ChB, Raul Coimbra MD,Ph.D., University of California, San Diego

Introduction: Trauma and injury are significant contributors to the global burden of disease, with 5 million deaths and 250 million disability-adjusted life years lost in 2015. This burden is disproportionally borne by low and middle income countries (LMICs). Solutions are complex, but one area for improvement is basic trauma education. The American College of Surgeons has developed the TEAM (Trauma Evaluation and Management) Course as an introduction to trauma care for medical students. We hypothesized that the TEAM course would be an effective educational program in LMICs and result in increased knowledge gains and retention similar to students in high-income countries (HICs).

Methods: The TEAM course was taught and students evaluated at two sites, one LMIC and one HIC, after obtaining approval from the HIC Institutional Review Board and medical school dean. Participation was optional for all students and results were blinded. The course was administered by a single educator for all sessions. Tests were given before and after the course, and again six months later.



Results: A total of 62 LMIC and 52 HIC students participated in the course and completed testing. Demographics for the two groups were similar. LMIC students started with a relative knowledge deficit, scoring lower on both pre- and post-course tests than HIC students, but gained more knowledge during the initial teaching session. After 6 months the LMIC students continued to improve, while the HIC students' knowledge had regressed.

Conclusion: The TEAM course is a useful tool to provide the basic principles of trauma care to students in LMICs, and should be expanded. Further study is needed to determine the impact of TEAM education on patient care in LMICs.

Session XVII: WTC III Session: Education
Paper 2: 6:15am - 7:15am

VARIED TRAINING EXPERIENCE AMONG 2-YEAR FELLOWSHIP CANDIDATES: EXPERIENCE MAY NOT EQUATE TO SELF-PERCIEVED COMPETENCE

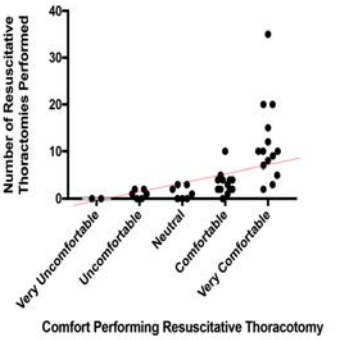
Richard C. Maduka BS, Sarah A. Moore MD, Patrick M. Reilly MD, Jon Morris MD, Mark J. Seamon MD, Daniel Holena MD, Lewis J. Kaplan MD, Niels D. Martin MD, University of Pennsylvania

Introduction: Fundamental training in trauma & surgical critical care is an integral component of general surgery residency and the critical base experience for the added educational qualifications of fellowship. We hypothesize that variations in clinical exposure exist and that perceived confidence will correlate with clinical experience.

Methods: With IRB approval and in a double-blinded fashion, all interviewees to a large, urban, academic, level one trauma, critical care, & emergency surgery fellowship were offered a 70-question survey. The survey focused on past clinical exposure and their perceived confidence in key areas relevant to fellowship. Experience was assessed via absolute numbers and confidence via a 5-point Likert scale; data is reported using descriptive statistics and linear regression.

Results: Forty-two of 44 completed the survey (95.5% response rate). 81% had exposure to a Level 1 trauma center during training. Experience and comfort varied greatly between procedures **(TABLE** and experience did correlate with self-perceived confidence in most procedures including resuscitative thoracotomy (**FIGURE**). However, the experience necessary to result in confidence was minimal, for cricothyroidotomy, 86% of respondents had done ≤ 2, but only 26% were uncomfortable with the procedure.

Procedures	Mean Number Performed (SD)	Mean Comfort (SD) [5 = Very Comfortable]
Recognizing Multiple Etiologies of Delirium and Coma		4.33 (0.61)
Treatment of Multiple Etiologies of Delirium and Coma		4.14 (0.65)
Performing a Brain Death Exam		***3.71 (0.94)***
Leading End of Life / Goals of Care Discussions		4.52 (0.63)
Independently Performing a Sternotomy	***5.81 (10.94)***	***3.17 (1.10)***
Identifying the Phrenic Nerve in the Chest		***3.8 (0.96)***
Exploring the Carotid Sheath		***3.35 (0.96)***
Performing a Resuscitative Thoracotomy	***5.33 (6.95)***	***3.74 (1.21)***
Open Cardiac Repair	1.48 (2.07)	
Interpreting Swan-Ganz Catheter Wave Forms and Pressures	***2.74 (3.11)***	***3.19 (0.99)***
Hemodynamic Assessment with Bedside Ultrasound		***2.90 (1.10)***
Arterial Catheter Placement	3.19 (10.67)	4.69 (0.68)
Central Venous Catheter Placement		4.95 (0.21)
Dialysis Access Catheter Placement		4.83 (0.38)
Pulmonary Artery Catheter Placement		***2.93 (1.13)***
Basic Ventilator Management (Initiation, Maintenance, and Weaning)		4.45 (0.74)
Advanced Ventilator Techniques (e.g. ARDSnet and APRV)		***3.64 (0.88)***
Preventing Ventilator Associated Adverse Events		3.9 (0.76)
Treating Ventilator Associated Adverse Events		3.98 (0.71)
Performing Bag Valve Mask Ventilation for Airway Management		4.67 (0.57)
Placing Supraglottic Airways for Airway Management		***3.81 (1.06)***
Performing Intubation for Airway Management		***3.17 (1.23)***
Placing Cricothyrotomies for Airway Management		***3.29 (1.02)***
Performing Bronchoscopy		4.52 (0.80)
Placing Percutaneous Endoscopic Gastrostomy Tubes		***4.24 (1.08)***
Performing a Pringle Maneuver	***2.76 (3.70)***	***3.4 (1.08)***
Packing a Major Liver Laceration	***4.64 (5.10)***	***3.69 (1.00)***
Managing Acute Kidney Injury		4.50 (0.59)
Performing Pre-Peritoneal Packing of the Pelvis for Hematoma	***0.9 (1.05)***	***2.86 (1.12)***
Gaining Access to the Major Vascular Structures of the Retroperitoneum		***2.83 (1.01)***
Gaining Supra-Celiac Control of the Aorta	***2.10 (3.68)***	***2.69 (1.02)***
Open Abdominal Aortic Procedures	3.52 (5.01)	
Performing Vascular Anastomoses With Suture ≤ 5-0	***29.74 (25.79)***	***3.79 (0.92)***
The Concept of Vascular Shunting		***3.38 (0.94)***
Steroid Use in Critical Care		3.43 (0.74)
The Components and Process of Massive Transfusion	16.24 (17.25)	4.14 (0.52)
Demonstrating Antibiotic Stewardship		4.14 (0.65)
Management of Most Surgical Infectious Diseases and Infectious Complications		4.33 (0.65)
Management of Septic Shock		4.57 (0.50)



Conclusion: Large variations in both experience and comfort within relevant training domains exists amongst 2-year fellowship interviewees. Importantly, domains with little experience did not impede applicants from reporting comfort with those skills. These disparate findings may inform fellowship program directors on curriculum development and appropriate training support structures.

Session XVII: WTC III Session: Education
Paper 3: 6:15am - 7:15am

COGNITIVE AND TEAM WORK RESUSCITATION SKILLS PERFORMANCE OF MEDICAL STUDENTS WITH THE TEAM® COURSE

Maria F. Jimenez* MD, Catalina Tobon MD, Andres Isaza MD, Victor Velandia MD, Felipe Vargas MD, Karen Brasel* MD,MPH, Stephen Bush MD, Sharon Henry* MD, Monique N. Drago edD, Ronald Stewart* MD, Hospital Universitario Mederi

Introduction: Trauma Evaluation and Management®(TEAM®) is an abbreviated version of the American College of Surgeons (ACS) Advanced Trauma Life Support® (ATLS®) course that introduces the concepts of trauma assessment and management. Errors in teamwork, leadership, and communication skills have been identified as major factor in adverse clinical events. Improvements in these areas are therefore of particular interest. The aim of this study is to evaluate immediate retention in knowledge, communication and team resuscitation skills performance using the team approach in medical students taking the TEAM course in Bogota, Colombia

Methods: The TEAM (3rd edition) format used for our course was: ATLS 10th Edition team approach initial assessment video demonstration, a 90-minute slide presentation, a series of clinical trauma case scenarios for small-group discussion, and skills sessions in 2 trauma simulation scenarios using the team approach. We performed an observational pre- and post- intervention comparison study of the effects the TEAM course had on cognitive and teamwork resuscitation skills performance. Cognitive skills were assessed by a 20-multiple-choice questionnaire with a pre and post-test assessment. Team clinical assessment and management skills performance was evaluated using checklist rating of critical decision making and overall performance evaluation in 2 trauma simulation scenarios. The effectiveness of the group during these simulated scenarios in the behaviors of assistance, communication, and situation assessment was evaluated by 2 independent raters using the Standardized Assessment for Evaluation of Team Skills (SAFE-TeamS) method.

Results: A TEAM course was conducted in November 2015 for 92 medical students in Bogota, Colombia. Participants displayed a significant improvement in cognitive skills ($p < 0.001$) on the post course evaluation. The 16-team groups demonstrated a significant improvement in their checklist rating of critical decision making ($p=0.01$), and overall teamwork performance evaluation ($p= 0.006$) between training and test trauma simulation scenario. The group's team performance as measured by the SAFE-TeamS method improved, but was not statistically significant ($p=0.12$).

Conclusions: Trauma Evaluation and Management course improves trauma didactic knowledge. Teamwork behaviors and resuscitation skills performance needs further study with a larger sample size. Trauma education and teamwork training as can be done with the ACS TEAM course is a critical component for trauma and safety care improvement worldwide.

Session XVII: WTC III Session: Education
Paper 4: 6:15am - 7:15am

The impact of International trauma rotation at Tygerberg hospital in South Africa; Comparison of surgical volume in an urban trauma center in Tokyo

Tsuyoshi Nagao MD, Takashi Fujita MD,Ph.D., Taichiro Tsunoyama MD,Ph.D., Hirohito Chiba MD, Kahoko Nakazawa MD,MPH, Tomohide Koyama MD, Kaori Ito MD, Yasufumi Miyake MD,Ph.D., Tetsuya Sakamoto MD,Ph.D., Teikyo University School of Medicine

Introduction: International rotation will get a chance of operations which surgeon rarely experienced in own country. The author has rotated in six months at Tygerberg hospital (TB) in South Africa.The purpose of this study was to compare the volume between our trauma center in Tokyo and TB in South Africa.

Methods: We conducted the retrospective chart review at our trauma center in Tokyo and compare the surgical volume which he experienced in TB for six months and the number of operations which he joined in Tokyo for fifteen months.

Results: The number of operations he joined in TB for six months was 175, and 151 of them were for trauma cases. The number of urgent trauma operations was 102 (68%), and that of penetrating and blunt injuries, GSW and Stab injuries were 85 (83%), 17 (17%), 46 (45%) and 39 (38%) respectively. Cardiac or large vessel injuries were 40 cases including 2 cardiac, 2 aortic, 5 subclavian artery, 6 iliac vessels, and 8 inferior vena cava injuries.

The number of operations for trauma cases he joined in Tokyo for fifteen months was 49, and the urgent operations were 27 (55%). Ten (37%) were penetrating injury and 17 (63%) as the result of blunt trauma.

The number of urgent trauma operations he could experience in South Africa for six months was approximately same as the number for five years at the one of the biggest trauma center in Tokyo, especially penetrating cases were for ten years.

The number of operations for trauma cases he joined in Tokyo for fifteen months was 49, and the urgent operations were 27 (55%). Ten (37%) were penetrating injury and 17 (63%) as the result of blunt trauma.

The number of urgent trauma operations he could experience in South Africa for six months was approximately same as the number for five years at the one of the biggest trauma center in Tokyo, especially penetrating cases were for ten years.

Conclusion: The international rotation in South Africa has impacted on learning for trauma surgery, especially for penetrating injuries. It has resulted in a private negotiation but not through a systematic and sophisticated organization. The personal reference by the surgical society should be necessary to rotate in foreign facility.

Session XVII: WTC III Session: Education
Paper 5: 6:15am - 7:15am

ATLS 20 YEARS - FROM HONG KONG TO MAINLAND CHINA

GUIXI ZHANG BS, MBBS MHSM MTS, JOHN WONG MD,Ph.D., The University Of Hong Kong-Shenzhen Hospital

Introduction: ATLS® was introduced into Hong Kong in 1997. In September 2016, 136 courses were given to students and 13 courses for instructors were organized, as well as 2100 doctors received ATLS® training. The setup of a new hospital managed by both Hong Kong and Shenzhen provided the possibility and opportunity to bring ATLS® into mainland China. However, language barrier has previously been a major obstacle against the promulgation of ATLS® into mainland China. How to set up an appropriate training area is also another big issue to deal with.

Methods: With the support and approval of the American College of Surgeons, ATLS® textbook was allowed to be translated into Chinese by a team from Shenzhen. Since September 2013, 20 ATLS® Providers from Shenzhen have been approved to attend English courses in Hong Kong, of which seven of these candidates have successfully achieved Instructor status. These Instructors are Putonghua-speakers who are now charged with the task of conducting the ATLS® courses in mainland China, based on the translated 9th Edition ATLS® Student Manual and other teaching materials. A multi-party group was formed and regular meetings were arranged to organize things in the future. A new surgical skills training center was designed and built to provide accurate preparation for ATLS® training purpose. Funding for this surgical skills training center was donated by philanthropists from Hong Kong. The training equipment list was purchased in Hong Kong and sent to Shenzhen. Chinese ATLS® instructors were trained in Hong Kong with a Singapore educator. A joint and transitional Chinese ATLS® course was organized in Hong Kong before the first Chinese ATLS® course held in Shenzhen, China.

Results: The Chinese ATLS® student manual was published in August 2016. The new surgical skills training center was completed and opened for ATLS® training. An ATLS® instructor group with mixed doctors from Hong Kong and Shenzhen was established to teach the first Chinese ATLS® course from September 26-28, 2016. An instructor course was also organized in December 2016 with the same educator from Singapore. In September 2017, a total of 6 courses were organized for students, with 80 doctors coming from across mainland China receiving ATLS® training and another 9 doctors receiving their instructor qualifications.

Conclusion: It is highly recommended that ATLS® courses be taught to doctors in mainland China who are involved in the management of trauma patients, as evidenced by the strong documented positive impact of ATLS® courses on cognitive knowledge, practical skills and critical decision making. The introduction of ATLS® into mainland China is, hopefully, a step to help develop a structured trauma service for the benefit of people in China.

Key words: ATLS® training; mainland China; Trauma education

WTC 19: Geriatrics/Outcomes **Sponsored by Japanese Association for the Surgery of Trauma (JAST)**

Location: Coronado A, Fourth Level (Harbor Tower)

Moderators: Amit Gupta, MD and Takashi Fujita, MD, India and Japan
Keynote: Takashi Fujita, MD, Geriatric Trauma in Japan

RIB FRACTURES IN THE ELDERLY: PHYSIOLOGY TRUMPS ANATOMY
Presenter: Nathan Schmoekel, DO, USA

TREATMENT OF SEVERELY INJURED PATIENTS - SMALL IMPACT, BIG DEAL. ELDERLY PATIENTS AFTER LOW-ENERGY TRAUMA AND LIFE-THREATENING CONSEQUENCES
Presenter: Orkun Özkurtul, MD, Germany

TRAFFIC ACCIDENTS FOR GERIATRIC PEDESTRIAN IN JAPAN
Presenter: Tadashi UMEHARA, MD, Japan

COMPARATIVE ASSESSMENT OF IN-HOSPITAL TRAUMA MORTALITY AT AN INDIAN TRAUMA CENTER WITH IN-HOSPITAL TRAUMA MORTALITY AT A LEVEL 1 TRAUMA CENTER IN THE UNITED STATES
Presenter: Tessa Adzemovic, BA, USA

PREHOSPITAL CARE IN INDIA: THE NEED OF THE HOUR
Presenter: Vignesh Kumar Shanmuganathan, MBBS, DNB, India

Session XVII: WTC III Session: Geriatrics/Outcomes
Paper 1: 6:15am - 7:15am

RIB FRACTURES IN THE ELDERLY: PHYSIOLOGY TRUMPS ANATOMY

Nathan Schmoekel DO, Jon Berguson BS, Jerry Stassinopoulos MD,MPH, Efstathios Karamanos MD, Pat Patton MD, Jeffery Johnson MD, Henry Ford Hospital

Introduction: Rib fractures in elderly patients are associated with substantial pulmonary morbidity and mortality; predicting which patients are at highest risk for late complications remains a dilemma. Most existing predictive models use anatomic, physiologic or laboratory parameters in isolation. The RibScore is an example of an anatomic only model that uses radiographs to assess severity of the fractures. In a single institution with a relatively young patient population, RibScore performed well. We hypothesized that in elderly patients, where frailty is a major driver of adverse outcomes, a purely anatomic model will underperform models that take into account physiologic and laboratory variables.

Methods: This is a retrospective chart review of adult trauma patients admitted from January 2014 to June 2017 at an academic level 1 trauma center. A total of 466 patients were identified with a blunt mechanism and ≥1 rib fractures by computed tomography scan. Patient care was driven by a protocol for initial disposition, pain management and pulmonary hygiene. Variables indicating adverse pulmonary outcomes included pneumonia, ventilator days, and tracheostomy. We examined three models for their ability to predict adverse outcomes: (1) Ribscore, (2) Modified Frailty Index (mFI), and (3) initial $PaCO_2$. Receiver operating characteristics (ROC) and area under the cure (AUC) were used to compare each approach. Logistic regression was used to identify independent predictors of adverse outcome.

Results: Fifty seven percent of the population was ≥ 55 years of age, and comprised our elderly cohort. Thirteen percent developed one or more pulmonary complications. Increased RibScore, mFI, and initial $PaCO_2$ were each statistically associated with risk. ROC AUC analysis of individual models predicted complications with the following concordance statistic (CS): Anatomic only (RibScore) yielded a CS of 0.79 (95% CI 0.69, 0.89) $p < 0.001$; Physiologic only (mFI) yielded a CS of 0.83 (95% CI 0.75, 0.91) $p < 0.001$; and Laboratory only (initial $PaCO_2$) yielded a CS of 0.88 (95% CI 0.80, 0.95) $p < 0.001$. A $PaCO_2$ threshold of 45 mm Hg yielded the highest sensitivity and specificity. The initial $PaCO_2$ had the highest discriminative ability of the three individual models. When examining independent predictors of developing complications, the initial $PaCO_2$ and mFI resulted in an adjusted odds ratio of 1.11 (95% CI 1.05, 1.18, $p < 0.001$) and 30.66 (2.35, 36.79, p 0.008) respectively. When the models were combined, a CS of 0.85 (95% CI 0.74, 0.91), $p < 0.001$ resulted for anatomic and physiologic; 0.88 (95% CI 0.80, 0.96) $p < 0.001$ for anatomic and laboratory; and 0.89 (95% CI 0.82, 0.96) $p < 0.001$ for physiologic and laboratory. Combining all three models yielded the best performance with a CS of 0.90 (95% CI 0.81, 0.97) $p < 0.001$.

Conclusion: An anatomic score (RibScore) can predict adverse outcomes in elderly patients with rib fractures. However, models based on mFI and $PaCO_2$ individually outperform the RibScore. A combination of all three models yields the highest discriminative ability. This combined approach should be used in assessing the overall severity of the injury, the prediction of complications, and the intensity of interventions in the elderly.

Session XVII: WTC III Session: Geriatrics/Outcomes
Paper 2: 6:15am - 7:15am

TREATMENT OF SEVERELY INJURED PATIENTS - SMALL IMPACT, BIG DEAL. ELDERLY PATIENTS AFTER LOW-ENERGY TRAUMA AND LIFE-THREATENING CONSEQUENCES

Orkun Özkurtul MD, Johannes K. Fakler MD, Christoph Josten MD,Ph.D., University Of Leipzig

Introduction: Due to demographic developments, the proportion of elderly patients among severely injured with an ISS ≥ 25 is becoming increasingly important. Their treatment is particularly challenging for trauma surgeons, not only because of the increased risk of mortality. The complex medication and the constantly growing mobility of the elderly is an additional risk. Moreover, the biomechanical and physiological effects of trauma in patients > 59 years of age differs fundamentally from those in younger patients < 60 years. The aim of our study was to investigate the differences in the trauma mechanism, treatment and therapy of this population compared to younger patients.

Methods:We carried out a retrospective evaluation from our own prospectively recorded data set of the trauma register of the German Trauma Society DGU® for the years 2010-2015. Included in the study were polytrauma patients with ISS>25, over 16 years of age and low energy trauma. A fall below 3m was defined as a low-energy trauma. All patients who died in the trauma bay were excluded. A poor outcome was defined as a Glasgow Outcome Scale (GOS) of 1-3 points. Descriptive data were recorded in addition to injury severity ISS, AIS, hospital stay, outcome, ITS and ventilation duration as well as dismissal in care facilities and domesticity. We conducted a subgroup analysis with patients > 59 vs. < 60 years. Statistical evaluation was carried out via univariate analysis and the significance test for subgroup analyses via t-test.

Results: Out of 1200 patients in our database, a total of 69 (6%) patients with ISS≥ 25 and low energy trauma were included, of whom 55 ≥ 60 years were and 14 < 60 years old, respectively. In the group of < 60-year-olds, the mean ISS was 28.27±7.5 (range 25-75) and 29.43 ± 5 (range 25-38) in the younger group. Elderly patients had a 5 times higher incidence of severe injuries despite minor trauma than younger patients and had a significantly worse outcome with 54.5% to 36.4% (p=0.05). Only 9 patients ≥ 60 years of age were discharged home, 14 (25.5%) older patients have died.

Conclusion: Patients in old age suffer 5 times more severe injuries with an ISS ≥ 25 than younger patients, despite low kinetic energy. For the treating colleague, knowledge of the effects of age-related physiological changes and the associated vulnerability of the musculoskeletal system is crucial. Only then a comprehensive treatment concept can be created and resources targeted. Despite established networks and interdisciplinary cooperation, the severely injured is and remains a major challenge for trauma surgeons.

Session XVII: WTC III Session: Geriatrics/Outcomes
Paper 3: 6:15am - 7:15am

TRAFFIC ACCIDENTS FOR GERIATRIC PEDESTRIAN IN JAPAN

Tadashi UMEHARA MD, Takashi FUJITA MD,Ph.D., FACS, Shinji NAKAHARA MD,Ph.D., Yasufumi MIYAKE MD,Ph.D., Tetsuya SAKAMOTO MD,Ph.D., Teikyo University School of Medicine

Introduction: Walking is strongly recommended as a health promotion strategy for elderly people. Traffic accidents in geriatric population are increasing rapidly in our aging society. The purpose of this study was to describe injured body regions among the elderly pedestrians compared with young population and the fatal injuries among them with the sample of Japan Trauma Data Bank (JTDB).

Methods: We extracted data of pedestrian injuries from the JTDB2016. Those with complete data of Age, ISS, Max AIS of 9 body region, and mortality were analyzed. The subjects were divided into two groups by age: Yong group(YG) was defined as the age from15 to 64 and old group(OG) as more than 65. We also conducted subgroup analysis for old group to compare between the survived and dead. Mann-Whitney's U test was used for non-parametrical analysis.

Results: In YG, 5883 subjects were extracted and median ISS(IQR) was 16(9-25). In OG for 6197, median ISS(IQR) was 20(10-30) ($p<0.001$). Madian Max AIS in OG was greater than that of YG in all body region except surface region. On subgroup analysis for OG, Median(IQR)of Max AISs compared death to survive were 4(4-5) vs.3(3-4) ($p<0.001$) in head, 4(3-4) vs.3(3-4) ($p<0.001$) in chest, 3(2-4) vs. 2(2-3) ($p<0.001$) in abdomen.

Conclusion: Geriatric pedestrian sustained severer injuries than young generation. For older population, severer head, chest and abdomen were associated with death. Reducing injury severity, possibly by pedestrian protection devices, may reduce pedestrian mortality in the case of vehicle-pedestrian collisions. ed with death. Reducing injury severity, possibly by pedestrian protection devices, may reduce pedestrian mortality in the case of vehicle-pedestrian collisions.

		15yo-65yo				65+					survive-				survive+				
		n	Median	1 IQR	3 IQR	n	Median	1 IQR	3 IQR	p	n	Median	1 IQR	3 IQR	n	Median	1 IQR	3 IQR	p
Max AIS	Head	3585	3	2	4	4221	4	3	4	0	1202	4	4	5	2828	3	3	4	0.000
	Neck	1469	1	1	2	1423	1	1	2	0.002	275	2	1	2	1075	1	1	2	0.053
	Face	36	1	1	1	21	2	1	3	0.013	8	2	1.25	3	13	1	1	3	0.374
	Chest	1962	3	3	4	2334	3	3	4	0.032	755	4	3	4	1481	3	3	4	0.000
	Abd.	870	2	2	3	767	3	2	3	0.000	288	3	2	4	451	2	2	3	0.000
	Spine	1043	2	2	3	1038	2	2	3	0.001	262	2	2	3	720	2	2	3	0.173
	Upper Ext	1568	2	1	2	1912	2	1	2	0.000	394	2	1	2	1408	2	1	2	0.573
	Lower Ext	2991	2	2	3	3578	3	2	3	0.000	868	3	2	5	2522	3	2	3	0.000
	Surfece	438	1	1	1	296	1	1	1	0.257	66	1	1	1	212	1	1	1	0.127
ISS		5557	16	9	25	5976	20	10	30		1402	34	25	43	4247	17	10	25	

Session XVII: WTC III Session: Geriatrics/Outcomes
Paper 4: 6:15am - 7:15am

COMPARATIVE ASSESSMENT OF IN-HOSPITAL TRAUMA MORTALITY AT AN INDIAN TRAUMA CENTER WITH IN-HOSPITAL TRAUMA MORTALITY AT A LEVEL 1 TRAUMA CENTER IN THE UNITED STATES

Tessa Adzemovic BA, Ankita Sharma Ph.D., Jeffrey L. Nadel BA, Amit Gupta MBBS, MS, Krishnan Raghavendran MD, Pauline Park MD, University of Michigan

Background: In India, a trauma-related death occurs every 1.9 minutes. While Trauma Center infrastructures have been developed to provide definitive trauma care, formal performance improvement initiatives remain in the early stages at both the national and individual hospital level. As an initial benchmarking exercise, we compared registry-based mortality data from the Jai Prakash Narayan Apex Trauma Centre (JPNATC) in New Delhi, India and Michigan Medicine in Ann Arbor, Michigan

Methods: Retrospective data was collected over four months from September 2015 to December 2015 as a part of the Australia–India Systems Collaborations (AITSC) project in the JPNATC-AIIMS New Delhi, India. For comparison, consecutive admissions from the University of Michigan's Trauma Registry for 2015 were abstracted. Data were managed Excel and SAS (Version 9.4, Cary NC). Univariate and bivariate descriptive statistics were generated for the following variables: age, gender, mechanism of injury, emergency department vital signs, GCS score, Injury Severity Score, ICU days, operative status, and mortality. Mortality was evaluated based on gender, mechanism of injury, GCS score, ISS, and destination. Statistical significance was considered at an alpha level of 0.05. Proportions were compared with a two sample Z-test for categorical and ordinal variables.

Results: A total of 1,505 patients were included in this study. Differences in population and patterns of mortality were apparent between the two systems. Patients in India were younger and overwhelmingly male. The most common cause of injury seen at JPNATC was motor vehicle accidents, which accounted for 56.4% of the injuries, followed by falls at 25.4%. Falls were more commonly seen in the US. Initial overall mean GCS was lower (12.9 vs.14.4, $p<0.05$), mean ISS was lower (8.96 vs 10.46, $p<0.05$) and RTS was lower (7.289 v 7.59, $p<0.05$). As expected, the overall mortality was higher at JPNATC compared to Michigan Medicine (3.3%, $P<0.05$). Mortality differences were not distributed evenly across all categories of injury; outsized differences were identified in minor brain injury (GCS 13-15, OR death 5.02, $p <.0001$) and in patients with even mild - moderate injury (ISS 0 -15, ISS 16-24, OR death 8.12, 12.77 respectively, $p<0.0001$).

Conclusions: Trauma care in India is still in a fragile state of development, and the societal burden remains high. We have shown that shared trauma performance improvement efforts can identify areas where interventions from a mature system could have impact in the Indian system. Specifically, further examination of potential opportunities for improvement in moderate injury and mild TBI between institutions may have mortality benefit. This work supports the ongoing importance of collaborative registry and performance improvement efforts in India.

Mortality(%)				
	MM	AIIMS	Mortality Ratio (AIIMS/MM)	p-value
Gender				
Male	3.89	12.32	3.17	<0.0001
GCS Score				
3-8	16.56	36.99	2.23	0.0007
9-12	12.5	17.65	1.41	0.6431
13-15	0.99	4.97	5.02	<0.0001
ISS, %				
0-15	1.18	9.58	8.12	<0.0001
16-24	1.45	18.52	12.77	<0.0001
25-75	26.09	25	0.96	0.9197

Session XVII: WTC III Session: Geriatrics/Outcomes Paper 5:
6:15am - 7:15am

PREHOSPITAL CARE IN INDIA: THE NEED OF THE HOUR

Vignesh Kumar Shanmuganathan MBBS, DNB, Amit Gupta MBBS, MS, Harshit Agarwal MBBS, MS, Biplab Mishra MBBS, MS, Sushma Sagar MBBS, MS, Subodh Kumar Garg MBBS, MS JPN Apex Trauma Centre, AIIMS

Introduction: India is a developing country and although our potential as a budding superpower seems irrefutable, we lag far behind when it comes to prehospital care. The availability of trained personnel and prehospital ambulance services, as well as the time taken to attend to the injured are severely compromised.

Methods: At a Level - I Trauma centre in New Delhi, We did a retrospective review of 2413 severely injured patients who presented to the hospital between January 2017 and June 2017. We also conducted a questionnaire-based interview of ambulance drivers (n=95).

Results: We found that majority of them were in the 3rd decade of life (24%). Interestingly, we noticed that 22% of them were children under 10 years of age, with fall from height contributing 84% injuries in this age group. The mechanism of injury was predominantly RTI (42%), closely followed by fall from height (37%). The average time to presentation was around 3 hours for these patients, with only 15% of them reaching within the golden hour. And among the 27% referred patients, only 15% reached the hospital within first 3 hours. Only 4% had an access to (or) preferred to use an ambulance to get to the hospital, and 63% had made it to the hospital by themselves or with the help of a relative via a private means of transit to the hospital. This established the fact about the non-availability of ambulances and the long response time. Most of the ambulances in the capital were patient transport ambulances. Very few of these ambulances had any kind of paramedic support (n=9), and even fewer ambulance drivers received any kind of formal pre-hospital training (n=7). An average ambulance in the country is usually a vehicle which can accommodate a driver, the patient and at most a couple of his/her relatives. Apart from a very few, that are part of elite hospitals or private owned hospitals, most ambulances lack a cervical collar, backboard, intravenous cannulas, and/or resuscitative fluids. Some even lack a proper first aid kit. When enquired about the delay, most ambulance drivers quoted the traffic and the lack of awareness among the general public as the reason behind the same. They also said that the “on-scene” time was practically near zero as they had no paramedic support. We also noted that the ambulances usually take the patient to the nearest hospital and the absence of field triage protocols result in some patients landing in centers which are under-equipped for patient care. Most patients had to pay for their transfer.

Conclusion: If the prehospital phase is delayed to such an extent in the capital of the country, one has to question the availability and the time taken at peripheral centers. India spends only 3% of its Gross Domestic Product (GDP) on healthcare. With such limited spending and the lack of government insurance cover for the poor and the needy, the future of healthcare in the country looks bleak. For a country which is looking to lock horns with the super giants of the world, it is not only necessary but also prudent to increase their outlay on healthcare services. There is a pressing need to formulate goals and work towards bringing about a change in the healthcare system which, at the moment, is in shambles.

WTC 20: Shock Resuscitation Sponsored by The Japanese Society for Acute Care Surgery (JSACS)

Location: Coronado B, Fourth Level (Harbor Tower)

Moderators: Sandro Rizoli, MD, PhD and Shigeki Kushimoto, MD, Canada and Japan
Keynote: Shigeki Kushimoto, MD, Traumatic Coagulopathy, Japan

TRAUMATIC LARYNGOTRACHEAL INJURIES – 7 YEAR EXPERIENCE FROM A LEVEL I TRAUMA CENTRE
Presenter: Vignesh Kumar Shanmuganathan, MBBS, DNB, India

INTER-HOSPITAL VARIATIONS IN RESOURCE USE INTENSITY IN INJURY DEATHS: A MULTICENTER COHORT STUDY
Presenter: Lynne Moore, PhD, Canada

UNPRECEDENTED SURGE ON BLOOD BANK DURING LARGEST MASS SHOOTING IN UNITED STATES' HISTORY
Presenter: Neal Foley, DO, USA

SHOCK INDEX AS A MORTALITY PREDICTOR IN A EMERGENCY RESUSCITATION IN TRAUMA PATIENTS
Presenter: Jose Charry, MD, PhD, Colombia

WITHDRAWN

Session XVII: WTC III Session: Shock/Resuscitation
Paper 1: 6:15am - 7:15am

TRAUMATIC LARYNGOTRACHEAL INJURIES – 7 YEAR EXPERIENCE FROM A LEVEL I TRAUMA CENTRE

Vignesh Kumar Shanmuganathan MBBS, DNB, Abhinav Kumar MBBS, MS, Biplab Mishra MBBS, MS, Amit Gupta MBBS, MS, Subodh Kumar Garg MBBS, MS, Sushma Sagar MBBS, MS JPN Apex Trauma Centre, AIIMS

Introduction: Laryngotracheal (LT) trauma is a potentially devastating injury that requires a high index of suspicion and prompt intervention to maximize survival and aerodigestive outcomes. Traumatic laryngotracheal injuries can be classified as external or internal, and due to blunt or penetrating mechanisms. Due to the protection offered by surrounding bony structures and numerous soft tissue suspensions, injuries to the laryngotracheal apparatus are considered infrequent. Respiration, phonation, and airway protection are all at risk following laryngeal injuries that potentially compromise the structural or neurologic integrity of the apparatus.

Methods: The study design was of a retrospective cohort of all patients with traumatic laryngo-tracheal injuries presenting to a level-I trauma centre in India between January 2011 and June 2017.

Results: A total of 48 patients presented to our centre with traumatic LT injuries over the 7 year time period. Majority of them were males (87.5%) and 50% patients in the 3 rd decade of life, with mean age of 30.7 years and range between 7-70 years. Penetrating injury accounted to 62.5% patients, out of which 40% were self-inflicted. 44% patients were referred from other hospitals, of which 42% presented after 24 hours of injury. Of all the primary patients, only 8 presented within the golden hour of trauma. Of the 48 patients, 13 were referred intubated, 13 needed immediate airway intervention at our centre. 85%patients had partial LT injury. 25 patients had associated injuries, with 7 having vascular injury, 11 with aero-digestive tract injuries. 19 patients underwent primary repair alone, 16 underwent primary repair with tracheostomy, 3 patients had a tracheostomy done, and 8 were managed non-operatively. We had a mortality of 4%, both patients due to other causes.

Conclusion: Although rare, blunt and penetrating trauma to the soft tissue structures of the neck is associated with high morbidity. Many of these injuries require operative intervention, and awareness of the injury with complete, prompt work-up and evaluation are important in order to implement timely, appropriate management. The management of LT traumatic injury continues to evolve, knowledge of current practices allows trauma surgeons to help guide surgical and interventional treatments.

Session XVII: WTC III Session: Shock/Resuscitation
Paper 2: 6:15am - 7:15am

INTER-HOSPITAL VARIATIONS IN RESOURCE USE INTENSITY IN INJURY DEATHS: A MULTICENTER COHORT STUDY

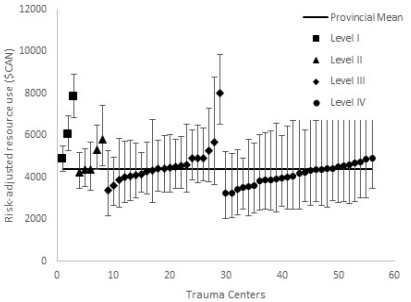
Lynne Moore Ph.D., Alexis F. Turgeon MD, MSc, Valérie Porgo Ph.D., Imen Farhat MSc, Coralie Assy MSc, Howard Champion* MD, Laval University

Introduction: Injury represents the first cause of life years lost and is second only to cardiovascular diseases in terms of acute care costs. Our group has previously shown significant variation in withdrawal of life-sustaining therapies for traumatic brain injury across Canadian trauma centers (Turgeon et al. CMAJ 2011). The intensity of care associated with death following injury is however, unknown. We aimed to evaluate inter-hospital variations in resource use intensity for injury deaths across trauma centers in an inclusive, mature Canadian trauma system.

Methods: We conducted a multicenter, retrospective cohort study including deaths following admission for injury to any of the 57 trauma centers in a Canadian trauma system between 2014 and 2016. We used data from a trauma registry linked to hospital discharge and hospital costing databases. Resource use intensity was measured by activity-based costs according to Canadian guidelines for the economic evaluation of health technologies and GRADE recommendations, whereby units of resource use were multiplied by unit costs. We used multilevel log-linear regression to calculate median activity-based costs adjusted for age, comorbidities, physiological status on arrival, injury type and severity and transfer. Inter-hospital variations in resource use intensity were measured using intraclass correlation coefficients (ICC) with 95% confidence intervals. Analyses were performed globally and by time to death (48h, 72h, 7 days), age (<65, ≥65 years) and injury type.

Results: We identified 2055 injury deaths among whom 12% died within 48h of arrival, 21% within 72h, and 44% within 7 days. Median activity-based costs were $4710 (quartiles 1 and 3: 1932-10,296). We observed significant inter-hospital variation in resource use intensity (ICC=7.3% [4.1-8.8], Figure 1). Mean risk-adjusted activity-based costs varied from $4863 to $7812 across level I trauma centers. Variations were still significant when we restricted analyses to deaths within 48h (ICC=10.6% [3.3-17.1]), within 72h (ICC=9.4% [5.8-12.7]) and within 7 days (ICC=7.9% [5.9-10.1]). Variation was higher for traumatic brain injuries (ICC=9.3% [5.1-12.4]) than overall and higher for patients aged <65 years (ICC=12.9% [3.1-19.1]) than for ≥65 years (ICC=6.2% [3.7-7.7]).

Conclusion: We observed significant variations in resource use intensity for injury deaths across trauma centers even after adjustment for patient case mix. These variations were greater in traumatic brain injury and younger patients. Results may reflect variations in decisions to withdraw life-sustaining therapies. Our group is currently working on improving the shared decision-making process in this population.



Session XVII: WTC III Session: Shock/Resuscitation
Paper 3: 6:15am - 7:15am

UNPRECEDENTED SURGE ON BLOOD BANK DURING LARGEST MASS SHOOTING IN UNITED STATES' HISTORY

Neal M. Foley DO, Nelly Chow DO, Cyrus Rahnema MD, Collin Stewart MD, Paul Nelson MD, Chris Fisher MD, Stefan Chock MD, Sunrise Health GME Consortium

Introduction: The most deadly mass shooting in modern U.S. history occurred in Las Vegas, Nevada on October 1, 2017, where 58 people were killed and 851 were injured at an outdoor concert. Bleeding is responsible for the majority of trauma deaths occurring within the first 24 hours, which has prompted public awareness programs like “Stop the Bleed Campaign.” Additionally, severely injured patients experiencing hemorrhagic shock often require massive transfusion. Earlier transfusion with higher blood products ratios (FFP:Platelets:RBC), defined as damage control resuscitation (DCR), has been associated with improved outcomes. (PROPPR trial). The surge for blood products at our level 2 trauma center during this unprecedented event has prompted further investigation into our blood product utilization. We aim to identify limiting factors in blood product transfusion and the feasibility of balanced resuscitation during a mass casualty event (MCE).

Methods: This is a review analysis of blood product utilization for all victims of the MCE at our institution. After obtaining approval from our IRB, we collected data for age, blood products administered, timing of transfusion, injury severity score (ISS), length of stay (LOS) and mortality. The total inventory of blood product within our blood bank and steps to transfusion were reviewed. Additionally, our team met with blood bank staff to address barriers and successes during this unanticipated event.

Results: We identified 23 patients who presented to our institution and required blood product transfusion. A total of 105 units of fresh frozen plasma, 174 units of platelets, 226 units of packed red blood cells, and 15 units cryoprecipitate were utilized during the MCE. We observed the most demand on the blood bank during the first 24 hours following admission; 100 units of FFP, 156 units of platelets, 198 units of pRBC were used during this timeframe. This represented 95.2% of all FFP, 89.7% of all platelets, and 87.6% of all pRBC utilized during the MCE. Of the 23 patients requiring transfusion, we further identified 11 patients who placed the highest demand on the blood bank. This subset of patients utilized 92.2% of total blood product used during the MCE, had an average ISS of 23.3, an average LOS of 21.25 and a transfusion ratio of 1:1.6:2. The mortality rate was 36.4 percent.

Conclusion: Clinical knowledge, supply constraints and logistical details play crucial roles if blood product provision is to be managed effectively. Events such as provider recognition, patient identification, inventory, restocking, product preparation and delivery, and teamwork impact component resuscitation during the surge for blood product. A major difficulty in trying to learn useful lessons from past incidents is a scarcity of clinical data. Our data suggests that balanced resuscitation is feasible and that centers should not deviate from this practice if restocking strategies are possible. Protocols must be developed and centers must prepare for MCE to mitigate inefficient usage of blood components during a mass shooting event.

Session XVII: WTC III Session: Shock/Resuscitation
Paper 4: 6:15am - 7:15am

SHOCK INDEX AS A MORTALITY PREDICTOR IN A EMERGENCY RESUSCITATION IN TRAUMA PATIENTS

Jose D. Charry MD,Ph.D., Oscar A. Dussan MD, Roberto J. Rodriguez MD, Hospital Universitario De Neiva

Introduction: Trauma is considered a public health problem, different scores are using for predicting mortality. The aim of this study was to evaluate whether the shock index, given by the formula SI = heart rate / systolic blood pressure (HR/SBP), is useful for predicting mortality at 24 in trauma patients admitted to the emergency department of a university hospital in Colombia.

Methods: We evaluated shock index (SI) at admission and generating a dichotomous variable with two groups: Group A (SI < 0.9) and Group B (SI> 0.9). we evaluated the inicial type of resuscitation used (colloids, crislatolides and blood). Bivariate and Multivariate analyses were used. For evaluated the correlation between shock index and the type of resuscitation the discriminatory power of the score, its accuracy and precision was assessed by logistic regression and as the area under the receiver operating characteristic curve. Shapiro Wilks, chi2 and Wilcoxon test were used

Results: 900 patients were analyzed, 57.22% (515) had SI < 0.9, and 42.78% (385) SI > 0.9.The mean age for groups A and B was 32.4 and 35.4 respectively. Injury Severety Score mean was 5.8 and 16.3 (p=0.001) respectively. Mortality at 24 hours after injury for SI > 0.9 group was 24.9 % in blood resucitation and 75.09% in Crystalloid Resuscitation (p = 0.001).

Conclusion: An initial shock index greater than 0.9 implies a worse prognosis 24 hours afterinjury. shock index allows evaluating the effectiveness of resuscitation in emergency department in a university hospital in Colombia, Shock index is a quick and applicable score.

PAPER 5 - WITHDRAWN

5:00-6:00 P.M.

5:00-6:30 pm

Session XXIV: WTC IV Sessions

WTC 21: Abdominal Trauma **Sponsored by SBAIT - Brazil Trauma Society**

Location: Golden Hill, Third Level (Seaport Tower)

Moderators: Gennaro Perrone, MD and Tercio Campos, MD, Italy and Brazil
Keynote: Tercio Campos, MD, Pancreatic Trauma

AVOIDING UNNECESSARY LAPAROTOMY IN SELECTED BLUNT AND PENETRATING TRAUMA PATIENTS: TIME FOR A PARADIGM SHIFT TOWARDS LAPAROSCOPIC MANAGEMENT
Presenter: Carlos Augusto Menegozzo, MD, Brazil

THE ADDITIONAL VALUE OF FOLLOW-UP TESTS IN THE ASSESSMENT OF SPLENIC FUNCTION AFTER BLUNT SPLENIC INJURY IN PEDIATRIC TRAUMA PATIENTS
Presnter: Roy Spijkerman, MD, Netherlands

SURGICAL OUTCOMES IN PANCREATIC TRAUMA: A 10-YEAR INSTITUTIONAL REVIEW
Presenter: Roberto Gonzalez, BS, USA

HYPOVOLEMIC SHOCK IN THE VIEW OF COMPUTED TOMOGRAPHY - IS THERE A PLACE FOR THESE SIGNS?
Presneter: Heitor Consani, MD, Brazil

NON-OPERATIVE MANAGEMENT IN ABDOMINAL PENETRATING INJURIES - WHERE DOES THE PROTOCOL LIE
Presenter: Sandeep Tiwari, MD, India

Session XXIV: WTC IV Session: Abdominal Trauma
Paper 1: 5:00pm - 6:00pm

AVOIDING UNNECESSARY LAPAROTOMY IN SELECTED BLUNT AND PENETRATING TRAUMA PATIENTS: TIME FOR A PARADIGM SHIFT TOWARDS LAPAROSCOPIC MANAGEMENT

Carlos Augusto M. Menegozzo MD, Sérgio H. Damous MD,Ph.D., Marcelo C. Rocha MD, Pedro H. Alves MD, Francisco S. Collet E Silva MD,Ph.D., Celso O. Bernini MD,Ph.D., Edivaldo M. Utiyama MD,Ph.D., University of Sao Paulo

Introduction: Despite being routine in elective procedures, laparoscopy is still limited in the emergency setting. The surgical community still struggles to incorporate laparoscopy in the management of trauma patients due to various limitations, including lack of technical skills, resources, and scarce evidence of safety and feasibility. However, laparoscopy has shown benefits in selected patients. The main objective of this study is to analyze the value of laparoscopy in avoiding unnecessary exploratory laparotomies. As a second outcome, evaluate the safety of the procedures, measured by complication and missed injury rates.

Methods: Retrospective chart review of consecutive blunt and penetrating trauma patients admitted from March 2010 to March 2018. We included all patients who were initially managed by laparoscopy. Demographic, clinical, intra and postoperative data were analyzed. Laparoscopy was divided in negative (no injuries found), positive, and therapeutic (injuries managed only with laparoscopy). Complications were depicted using Clavien-Dindo classification.

Results: Complete data was obtained in 128 cases. One hundred and five were male (82%), mean age was 32 years-old. Blunt mechanism was present In 58 cases (45%) and the median ISS was 13 (4-50). Out of the 70 penetrating traumas, with the median ISS of 13 (1-29), 51 were due to stab wounds. Firearm injury was present in 19 (15%) of the studied population. The most common indications for laparoscopy in blunt trauma were free fluid with no solid organ injuries in 33 cases (57%) followed by persistent abdominal pain (12%) and diaphragmatic hernia (10%). In penetrating trauma, thoracoabdominal injury (49%) and suspected peritoneal violation (19%) were the main indications for laparoscopy. Of the laparoscopic procedures, 86 were positive, of which 42 (49%) were therapeutic. Main therapeutic procedures were diaphragmatic repair (50%), hollow viscus suture (26%), and solid organ hemostasis (14%). Thirty-four (26%) were negative laparoscopies. Twenty-four patients had laparotomies. Of those, 13 (54%) had small midline incisions for intestinal suture or ressection, with no cavity re-exploration. Main reasons for the 11 conversions to exploratory laparotomy were moderate hemoperitoneum (45%) and technical difficulties (36%). There were 8 Clavien $\geq$ 3 complications. A single case of missed injury (main pancreatic duct) was associated with a Clavien 3a complication (percutaneous drainage of fistula). Two patients died (1,5%) due to septic complications. Unnecessary exploratory laparotomies were avoided in 91% of the patients.

Conclusion: Laparoscopic management of trauma patients is feasible and safe in selected blunt and penetrating patients. Complication and missed injury rates were low. Unnecessary exploratory laparotomies, and their early and late complications, were avoided in 91% of the cases.

Session XXIV: WTC IV Session: Abdominal Trauma
Paper 2: 5:00pm - 6:00pm

THE ADDITIONAL VALUE OF FOLLOW-UP TESTS IN THE ASSESSMENT OF SPLENIC FUNCTION AFTER BLUNT SPLENIC INJURY IN PEDIATRIC TRAUMA PATIENTS

Roy Spijkerman MD, Marijn Kip Michel P. Teuben MD, Falco Hietbrink MD,Ph.D., Luke P. Leenen MD,Ph.D., UMC Utrecht

Introduction: Splenectomy used to be the main treatment modality for blunt splenic injury (BSI). Nowadays, even patients with high grade BSI are preferably treated using spleen preserving treatments (SPT). It is assumed that patients with low grade BSI treated with SPT have a good splenic function after recovery. However, there is no consensus on splenic function after high grade BSI. In several institutions, asplenic/hyposplenic infection prevention protocol will be executed in all patients who had SPT after high grade BSI, where other institutions evaluate splenic function first. Scintigraphy is believed to be the best flow/activity test to approximate splenic functionality. The aim of the study was to analyze whether spleen injury grade is associated with diminished splenic function. Secondarily, we aimed to evaluate whether splenic function testing is necessary in pediatric patients after BSI.

Methods: A retrospective study was performed in our level I trauma center from January 1998 to January 2018. In our institution patients with BSI grade IV of V are assumed hyposplenic and will receive a splenic function test. We included all patients with a minimum follow-up test period of 5 days. All tests were analyzed by the radiology specialist. For each patient we furthermore collected clinical data, including the date of trauma, gender, age, mechanism of injury, Abbreviated Injury Score (AIS) of splenic injury and Injury Severity Score (ISS).

Results: During the 20 year inclusion period we included 33 patients consisted of 23 male and 10 female, with a median (IQR) age of 11,8 (7,3 – 13,5). Median ISS was 16,0 (13 – 30,5) and the median spleen AIS was 4 (3 – 4). Non-operative management was used in 26 patients, angio-embolization in five patients and two patients were treated with surgical mesh technique. The median follow-up time of all performed tests was 59 (22 – 75) days. A total of 20 patients (61%) had a grade IV or V splenic injury. Scintigraphy was utilized to test most patients. After testing, a total of 32 out of 33 patients had an adequate splenic function, including all angio-embolization patients. Only one patient with a grade II splenic injury after surgical mesh technique showed no splenic function.

Conclusion: So in conclusion, even high grade splenic injuries show adequate splenic function in the follow-up of pediatric trauma patients after BSI. Therefore routine diagnostic follow-up by scintigraphy is not necessary in this specific patient group.

Session XXIV: WTC IV Session: Abdominal Trauma
Paper 3: 5:00pm - 6:00pm

SURGICAL OUTCOMES IN PANCREATIC TRAUMA: A 10-YEAR INSTITUTIONAL REVIEW

Roberto Gonzalez BS, Indigo Johnson BS, Janika San Roman MPH, John Gaughan Ph.D., Steven Ross* MD, Joshua P. Hazelton* DO, Cooper University Hospital

Introduction: The use of damage control laparotomy following abdominal trauma has been well documented, however, the clinical outcomes following damage control laparotomy in patients with pancreatic injury has not been well studied. The aim of this study is to compare the clinical outcomes of patients who underwent damage control laparotomy (DCL) or single surgery (SS) for their pancreatic injury.

Methods: A retrospective review (2006-2016) of patients who presented to an urban Level 1 Trauma Center with a diagnosis of pancreatic injury, either from a blunt or penetrating mechanism, was performed. All patients who had operative intervention to the pancreas (debridement, resection, or repair) were included. Non-operative patients or patients who did not have a procedure to the pancreas were excluded. Post-surgical outcomes were compared between groups. A $p \leq 0.05$ was considered significant.

Results: During the study period, 111 patients were found to have a pancreatic injury (blunt n=72; penetraing n=39); 85 (77%) had a laparotomy, and 26 (23%) were non-operatively managed and excluded. Of the 85 patients in this series who underwent exploratory laparotomy for intra-abdominal injury, 44 patients (52%) had operative intervention involving the pancreas. Of these 44 patients, 24 (55%; blunt n=10; penetrating n=14) had a damage control laparotomy procedure while the remaining 20 (45%; blunt n=12; penetrating n=8) had a single surgery with primary closure. There was no difference between the groups in terms of age, race, mechanism of injury, grade of injury, or anatomic location of injury (all $p>0.05$). The damage control surgery group had a higher ISS (22 vs 15), abdominal AIS (3.5 vs 2.4), more ventilator days (8.4 vs 2.7), longer ICU LOS (14.5 vs 7.4), and more blood products transfused [PRBC (22 vs 5.1), FFP (18.1 vs 3.3), PLT (2.2 vs .4)] than the single surgery group (all $p \leq 0.05$). There was no difference in mortality or post-surgical pancreatic complications ($p>0.05$) between the damage control and single surgery groups.

Conclusion: Patients with a pancreatic injury, from either a blunt or penetrating mechanism, who required damage control laparotomy were more severely injured than those who did not require damage control surgery. There were no differences in mortality or pancreas related post-surgical complication rates between these two groups. Damage control techniques allow the management of more severely injured patients with pancreatic trauma without increases in mortality or complications.

Session XXIV: WTC IV Session: Abdominal Trauma
Paper 4: 5:00pm - 6:00pm

HYPOVOLEMIC SHOCK IN THE VIEW OF COMPUTED TOMOGRAPHY - IS THERE A PLACE FOR THESE SIGNS?

Heitor F. Consani MD, YASMINE REBECCHI CONJUNTO HOSPITALAR DE SOROCABA

Introduction: The presence of tomographic (CT) signs indicative of hypovolemic shock (CTSH) in children has been reported in the medical literature for some time, however these possible signs for the adult are still not well studied. In order to contribute to the tomographic evaluation of patients with blunt abdominal trauma on the presence of shock, we retrospectively studied the ct and hypothesized that these findings may be representative of a clinical state of hypoperfusion.

Methods: We retrospectively reviewed 46 patients with adult blunt abdominal trauma treated at our emergency unit (ERU) with a Severity of Injury Index (ISS) greater than 15 and a systolic blood pressure lower than 90 mm Hg and submitted to thoracoabdominal CT during a period of 24 months, demographic and clinical data of the registered patient were also analyzed. All the reports of the CT scans were evaluated by the radiology service and after evaluation of the medical records a new discussion with the radiologists was made.

Results: 32 patients (69%)of our sample had signs of hypovolemic shock, and the average number of signs per patient was 4. The most common findings in patients with CTSH were the presence of free peritoneal fluid, increased uptake and / or dilatation of the small intestine, flattened inferior vena cava (IVC) and flattened renal veins. VCI and flattened renal vein as well as active contrast extravasation were found in patients presenting with low hemoglobin and greater need for transfusion. Another analysis identified dilatation of the small intestine and splenic injury may be factors associated with mortality and a greater chance of laparotomy.

Conclusion: CTSH can correlate with clinical hypoperfusion in patients with closed trauma and still provide important prognostic and therapeutic implications. The presence of CTSH in patients with closed trauma should call for immediate attention and may require rapid intervention. Despite the small study with retrospective design, we can warn that trauma surgeons should seek to understand these signs and consequently include them in the evaluation of patients with closed abdominal trauma as to the decision making mainly regarding the surgical conduct

Session XXIV: WTC IV Session: Abdominal Trauma
Paper 5: 5:00pm - 6:00pm

NON-OPERATIVE MANAGEMENT IN ABDOMINAL PENETRATING INJURIES - WHERE DOES THE PROTOCOL LIE

Sandeep Tiwari MD, Yadvendra Dheer MD, Anita Singh MD, Vaibhav Jaiswal MD, Narendra Kumar MD, King George's Medical University

Introduction: Penetrating trauma is fast becoming the leading cause of trauma due to intentional harm, as a result of increased use of weapons and firearm. According to WHO report, there is increased use of firearm weapon all over the world. The war zone of the globe is already reeling under the pressure of such patients. These patients occupy maximum numbers of beds in the hospitals and challenge the trauma system in that part of the world. Even the free gun licensing in the U.S.A. and other countries also have increased the incidence of firearm injuries. India has a strict law of firearm licensing but is still has an increasing trend in firearm and other penetrating injuries, maybe due to more number of illegal and country-made weapons. Terrorism also is a challenge and causes severe injuries due to penetrating injuries. Patients with abdominal penetrating injuries occupy the maximum number of beds in trauma surgery department and OR are kept busy with the operative intervention of these patients.

Methods: This is a retrospective observational study conducted in the department of trauma surgery KGMU, U.P. Lucknow, India from December 2016 to February 2017. Total 252 patients with firearm injury abdomen were admitted to trauma surgery department.

Results: Out of these 252 patients, 230 patients were operated and landed in OR after primary survey, resuscitation, and investigations. 22 patients were in grey zone and had no positive radiological or clinical finding to justify immediate surgery. Out of 22 patients who were initially managed by non-operative measures, 10 had stab injuries and 12 had firearm injuries. Out of 12 firearm injuries patients, 5 had pallet (shotgun) injuries and 7 had bullet injuries. Out of the total of 22 patients of penetrating abdominal trauma 3 patients of stab wound injuries and 4 patients of firearm injuries (2 pallet injuries and 2 bullet injuries) were operated after 48 hours of the Admission and had late signs and symptoms. While 7 patients with stab injuries and 8 patients of the firearm injury abdomen (3 pallets and 5 bullet injuries), patients were managed by non-operative management.

Conclusion: The penetrating abdominal injuries are challenging and drama involved with these patients, tempt the trauma surgeon to the role the patient to OR. But a good serial clinical examination, radiological examination, and other investigations may prevent unnecessary laparotomies and reduced mortality and morbidity. The dictum of penetrating injuries of the abdomen are managed in OR, stays challenged for our institution.

WTC 22: Shock/Resuscitation **Sponsored by The Japanese Society for Acute Care Surgery (JSACS)**

Location: Torrey Hill, Third Level (Seaport Tower)

Moderator: Christine Gaarder, MD, PhD and Atsushi Shiraishi, MD, Norway and Japan
Keynote: Atsushi Shiraishi, MD, The Effects of TXA on Trauma

IS THERE A MORTALITY DIFFERENCE IN TRAUMA PATIENTS REPATRIATED TO NON-TRAUMA CENTERS? PILOT DATA FROM AN EAST MULTI-CENETR TRIAL
Presenter: John Agapian, MD, USA

PREDICTION OF PATIENTS WITH MAJOR TRAUMA REQUIRING MASSIVE BLOOD TRANSFUSION : A COMPARISON OF ABC, TASH, PWH, SI SCORES
Presenter: Ahram Han, MD, South Korea

ASSOCIATION OF THE TIME INTERVAL FROM HOSPITAL ARRIVAL TO CT SCANNING WITH MORTALITY AMONG ADULT TRAUMA PATIENTS WITH PREHOSPITAL SHOCK ON SCENE; A NATIONWIDE HOSPITAL-BASED REGISTRY IN JAPAN
Presenter: Takeyuki Kiguchi, MD, PhD, Japan

LOOKING AT THE OTHER SIDE OF THE COIN: USING VISCOELASTIC METHODS (ROTEM) TO HOLD BLOOD TRANSFUSIONS IN TRAUMA PATIENTS
Presenter: Jose Parreira, MD, PhD, Brazil

TRIBULATIONS OF CONDUCTING RANDOMIZED CONTROLLED TRIALS IN COLOMBIA: THE EXPERIENCE FROM THE CELTA TRIAL (HYPERTONIC SALINE FOR EARLY ABDOMINAL FASCIAL CLOSURE AFTER EMERGENT LAPAROTOMY IN TRAUMA PATIENTS)
Presneter: Alberto Garcia, MD, Columbia

Session XXIV: WTC IV Session: Shock/Resuscitation
Paper 1: 5:00pm - 6:00pm

IS THERE A MORTALITY DIFFERENCE IN TRAUMA PATIENTS REPATRIATED TO NON-TRAUMA CENTERS? PILOT DATA FROM AN EAST MULTI-CENETR TRIAL

John V. Agapian MD, FACS, FCCM, Pascal Bortz MD, Jonathan Vo MD, Edmund Burke MD, Hector Ludi MD, Anthony Firek MD, Afshin Molkara MD, University Of California, Riverside/RUHS; LLU

Introduction: The Committee on Trauma has pledged towards 'Zero Preventable Deaths' in U.S. trauma systems. The feasibly of this mission with the trauma patient that is repatriated to a non-trauma center is the focus of an ongoing multi-center study sponsored by EAST (eastern association for the surgery of trauma). The impetus to transfer patients to non-trauma centers is predicated on the Affordable Care Act; health plans require repatriation of these patients to their assigned medical centers, many of which are not designated trauma centers.

Methods: Multicenter data is being collected to tract 90-day mortality rates of trauma patients transferred to non-trauma center. A 1:1 match of independent variables including age, gender, Injury Severity Scale (ISS), Trauma Injury Severity Scale (TRISS) is used to compare death rates to expected mortality.

Results: To date, we have 9 patients enrolled. 90 day mortality = 4.9% for transferred patients. Expected mortality = 4.1%

Conclusion: Preliminary data does not suggest a mortality difference in repatriated trauma patients who receive their secondary care at non-trauma centers, if they received their initial care at a designated trauma center.

Session XXIV: WTC IV Session: Shock/Resuscitation
Paper 2: 5:00pm - 6:00pm

PREDICTION OF PATIENTS WITH MAJOR TRAUMA REQUIRING MASSIVE BLOOD TRANSFUSION : A COMPARISON OF ABC, TASH, PWH, SI SCORES

Ahram Han MD, Myung Jin Jang Dae Sung Ma MD, Seok Joo MD, Sung Jin Kim MD, Sung Youl Hyun MD, Gachon University Gil Medical Center

Introduction: Several scoring systems that predict the need of massive transfusion (MT) in trauma patients have been proposed. The aim of this single center retrospective study was to validate the accuracy of existing scoring systems in Korean trauma patients.

Methods: Among trauma patients who were admitted to a regional trauma center between January 1, 2014 and December 31, 2016, those who were ≥13 of age, with injury severity score over 15, and who had received ≥ 1 RBC units during initial 24 h were included. Previously developed scores [Assessment of Blood Consumption (ABC), Trauma-Associated Severe Hemorrhage (TASH), Prince of Wales Hospital (PWH), and shock index (SI)] were calculated for each patient according to the published methods. Performance of each scoring system to predict the need of MT was compared using area under the receiver operator curve (AUROC). MT was defined as (1) ≥1 RBC unit within 2 h and (2) ≥5 RBC units or death from hemorrhage within 4h.

Results: Among the 562 patients who met the inclusion criteria, 176 (31.3%) patients were classified as MT patients. According to multivariate logistic regression, initial systolic blood pressure, heart rate, Glasgow coma score, and free abdominal fluid were associated with MT. When receiver operator curve of ABC, TASH, PWH, and SI were plotted, all four scoring systems were good predictors of MT with AUROC of 0828, 0.844, 0.866 and 0.811, respectively. When previously reported cut-off values were applied, ABC, TASH, PWH scores showed high specificity (93.8%, 96.8%, and 93.4% respectively), but low sensitivities (50.6%, 31.8%, and 49.1% respectively).

Conclusion: ABC, TASH, PWH, and SI showed comparable capabilities in predicting MT in Korean trauma patients. However, previously proposed cut-off values of ABC, TASH, and PWH were skewed towards higher specificity leading to low sensitivity and high false negative rate.

Session XXIV: WTC IV Session: Shock/Resuscitation
Paper 3: 5:00pm - 6:00pm

ASSOCIATION OF THE TIME INTERVAL FROM HOSPITAL ARRIVAL TO CT SCANNING WITH MORTALITY AMONG ADULT TRAUMA PATIENTS WITH PREHOSPITAL SHOCK ON SCENE; A NATIONWIDE HOSPITAL-BASED REGISTRY IN JAPAN

Takeyuki Kiguchi MD,Ph.D., Hiroshi Ogura* MD,Ph.D., Yusuke Katayama MD,Ph.D., Tomoya Hirose MD,Ph.D., Junya Sado Tasuku Matsuyama MD,Ph.D., Kosuke Kiyohara Taku Iwami MD,Ph.D., Satoshi Fujimi MD,Ph.D., Tetsuhisa Kitamura MD,Ph.D., Osaka General Medical Center

Introduction: In recent years, the implementation of computed tomography (CT) scanning has become faster and provided physicians various information on patients. Therefore, in treatments of trauma patients, CT scanning is absolutely necessary. However, the appropriate timing of CT scanning is still unknown among trauma patients with shock vital. The purpose of this study was to assess the relationship between the time from hospital arrival to CT scanning and mortality among adult trauma patients with prehospital shock on scene.

Methods: We used data from the Japan Trauma Data Bank, in which 256 institutions of all over Japan have been involved since 2008 through 2015. Adult trauma patients with prehospital shock vital on scene were included in our study. Patients who were transferred to another hospital, and traumatic cardiac arrest on hospital arrival were excluded, and they were divided into the following three groups according to the time interval from hospital arrival to CT scanning; immediate scanning group of 0-29 mins, intermediate scanning group of 30-59 mins, late scanning group of more than 60 mins. We analyzed separately the head injury patients (Abbreviated Injury Scale of head ≥3) and trunk injury patients (Abbreviated Injury Scale of chest or abdomen ≥3). Primary outcome was mortality on discharge. Multivariable logistic regression adjusting for age, sex, day of week, Injury Severity Score, Glasgow Coma Scale on hospital arrival, shock on arrival, focused assessment with sonography for trauma (FAST), and the time interval from finding to hospital arrival was performed to test the association between CT scan timing and mortality by the type of injury (head or trunk).

Results: A total of 23,988 patients were included. Of them, the immediate group were 10066 (42%), the intermediate group were 9753 (40.6%), and the late group were 4169 (17.4%). Among head injury patients, mortality gradually increased from 25.3% to 30.4% as CT scan timing delayed (p for trend =0.02). The adjusted odds ratio of the late group for mortality after adjusting for potential confounders was 1.28 (95% confidence interval, 1.04-1.57) compared with the immediate group. Among trunk injury patients, mortality gradually increased from 13.1% to 21.0% as CT scan timing delayed (p for trend <0.001). The adjusted odds ratio of the late group for mortality was 1.37 (95% confidence interval, 1.12-1.67).

Conclusion: Among adult trauma patients with shock on scene, delayed CT scan timing was associated with increased mortality on discharge.

Session XXIV: WTC IV Session: Shock/Resuscitation
Paper 4: 5:00pm - 6:00pm

LOOKING AT THE OTHER SIDE OF THE COIN: USING VISCOELASTIC METHODS (ROTEM TO HOLD BLOOD TRANSFUSIONS IN TRAUMA PATIENTS

Jose G. Parreira MD,Ph.D., Carolina Gomez MD, Joao B. Rezende - Neto MD,Ph.D., Sandro Rizoli MD,Ph.D., St. Michael's Hospital

Introduction: Hemorrhage and coagulopathy are a major cause of death and morbidity in trauma. Exams using viscoelastic characteristics of the clot have been introduced more recently to guide blood product transfusions in these patients. The objective of this study was to assess the importance of ROTEM parameters as a tool to hold transfusions in trauma patients.

Methods: Retrospective analysis of the trauma registry data in a period of 12 months, starting in November, 2014, including all adult patients that had a ROTEM test upon hospital arrival. We used the ROTEM cut-offs parameters (Extem CT, Extem A10, Extem MCF, Extem CFT, Extem ML, Extem Angle, FibtemA10 and Fibtem MCF), as defined by the manufacturer, to assign patients into one of two groups: “normal” or “abnormal”. The variable “normal ROTEM” (NL ROTEM) was created to identify patients in whom all ROTEM parameters were normal. The two groups were compared regarding the use of blood products in 2x2 tables. Negative predictive values (NPV) for blood products transfusion were calculated. The utilization of blood products was assessed regarding the type and the volume of transfusion. These analyses were repeated in subgroups of patients with ISS>15, as well as, with systolic blood pressure (SBP) lower than 90mmHg on admission. Chi square and Fisher's exact tests were used for statistical analysis, considering $p<0.05$ as significant

Results: 793 patients fulfilled the inclusion criteria. Blunt trauma accounted for 80.2% of the admissions (73.5% were male). Median age was 42 y.o. (range 15-96). Forty six patients (5.8%) were admitted with SBP lower than 100 mmHg, and 161 (20.3%) sustained a AIS head higher than 2. Median ISS was 9 (2-19) and 269 patients sustained an ISS>15 (33.9%). At least one unit of blood products was transfused in the first 24 hours in 92 (11.6%) cases and NL ROTEM was observed 604 (76.2%) patients. The NL ROTEM NPV in predicting the transfusion of: any blood product (BBP), plasma (FFP), platelets (PLT) and massive transfusion (MT) were, respectively, 94.7%, 98.3%, 98.8% and 99.7%. Regarding patients with ISS>15, the NL ROTEM NPV in predicting the transfusion of: BBP, FFP, PLT and MT were, respectively, 83.8%, 92.5%, 96.3% and 98.8%. In the subgroup of patients admitted with SBP<90 mmHg, NL ROTEM predicted 14/15 (93.3%) cases in which MT did not happen.

Conclusion: There is evidence that NL ROTEM is able do identify patients who will not need BBP transfusions in the first 24 hs. after trauma, even in subgroups of patients sustaining severe injuries and hemodynamic instability.

TRIBULATIONS OF CONDUCTING RANDOMIZED CONTROLLED TRIALS IN COLOMBIA: THE EXPERIENCE FROM THE CELTA TRIAL (HYPERTONIC SALINE FOR EARLY ABDOMINAL FASCIAL CLOSURE AFTER EMERGENT LAPAROTOMY IN TRAUMA PATIENTS

ALBERTO F. GARCIA MD, JULIAN CHICA MD, ALVARO I. SANCHEZ MD,Ph.D., RAMIRO MANZANO MD, MARIA P. NARANJO MD, JORGE H. MEJIA MD, GUSTAVO A. OSPINA MD,Ph.D., CARLOS A. ORDOÑEZ MD, JUAN C. PUYANA MD, FUNDACION VALLE DEL LILI

Introduction: A randomized controlled trial (RCT) evaluating the effect of hypertonic solutions (HS) for abdominal fascial closure (AFC) after damage control laparotomy (DCL) in trauma patients was proposed and started to recruit patients since November of 2015. We described our experience on conducting a RCT in Colombia and provided preliminary data.

Methods: Since November 2015, trauma patients who require DCL were randomized to 50mL/hour of HS during the next 70 hours following laparotomy plus standard fluid resuscitation, or standard fluid resuscitation alone. Sample size was calculated on 400 patients in a multicenter fashion. However, the National Institute of Food and Drug Monitoring (INVIMA) implemented on May 2016 a new regulation and required an insurance that increased dramatically the costs of conduction of the trial, discouraging other settings, and limiting our ability to conduct the trial in our hospital. Labels were not open for this preliminary data analysis.

Results: From our hospital and during November 2015-December 2017, we were able to recruit 35 patients. Mean age was 33.6 years (standard deviation [SD], 13.2); 31 were males (88.6%). Mechanism of injury was penetrating in 29 patients (82.8%). Mean injury severity score was 26 (SD, 11.1). Mean fluid balance at day 4 were 803cc (SD, 1248) and -137cc (SD, 1732) for each group (p=0.109). Between groups, AFC was achieved in 14 patients (77.7%) and in 15 patients (93.7%), respectively (p=0.340).

Conclusion: Regulatory barriers and budget limitations exist for the conduction of trauma trials in Colombia. This preliminary data analysis demonstrated nonsignificant trends towards differences in fluid balance at day four and AFC rates, when we compare the study groups. To date, there has been no need to open labels for safety reasons. Question remains whether results will favor the intervention group after other centers helps us to finishing the trial and we are able to open the study labels.

WTC 23: Trauma Education **Sponsored by Chinese Medical Doctor Association Trauma Committee (CMDATC)**

Location: La Jolla, Second Level (Seaport Tower)

Moderator: Ashok Puranik, MD and Lian-Yang Zhang, MD, India and China
Keynote: Guixi Zhang, BS, MBBS, MHSM, MTS, Trauma Education in China, China

THE FEASIBILITY OF TELEPHONE-ADMINISTERED INTERVIEWS TO EVALUATE LONG-TERM OUTCOMES OF TRAUMA PATIENTS IN SUB-SAHARAN AFRICA
Presenter: Adam Laytin, MD, MPH, USA

A PROSPECTIVE ANALYSIS OF SHORT AND MID-TERM KNOWLEDGE RETENTION AFTER AN ULTRA-SHORT ULTRASOUND COURSE FOR MEDICAL STUDENTS
Presenter: Carlos Augusto Menegozzo, MD, Brazil

PREPARED TO CARE: AN EXPLORATION OF CONTINUING EDUCATION TRENDS OF NURSES CARING FOR INJURED CHILDREN
Presenter: Linda Roney, RN, USA

ESTABLISHMENT OF TRAUMA SYSTEM FRAMEWORK IN SHENZHEN, CHINA
Presenter: Guixi Zhang, BS, MBBS, MHSM, MTS, China

WORLD TRAUMA EDUCATION: HEMORRHAGE CONTROL TRAINING FOR HEALTHCARE PROVIDERS IN INDIA
Presenter: Lindsay Smith, BA, USA

Session XXIV: WTC IV Session: Trauma Education
Paper 1: 5:00pm - 6:00pm

THE FEASIBILITY OF TELEPHONE-ADMINISTERED INTERVIEWS TO EVALUATE LONG-TERM OUTCOMES OF TRAUMA PATIENTS IN SUB-SAHARAN AFRICA

Adam Laytin MD,MPH, Nebyou Seyoum MD, Aklilu Azazh MD, Ayalew Zewdie MD, Rochelle Dicker MD, Catherine Juillard MD,MPH, University of California, San Francisco

Introduction: Accurate measurements of the long-term functional outcomes of trauma patients in low-income countries are crucial to evaluate the quality of trauma care and inform advocacy efforts. In sub-Saharan Africa, most long-term functional outcomes data are collected from clinic follow-up visits, which can introduce significant sampling bias since both the healthiest and most significantly disabled patients may be less likely to return to clinic. Mobile phone service is rapidly expanding in sub-Saharan Africa, and 70% of the population now has mobile phone coverage. In light of this growing technology, we sought to determine whether structured, telephone-administered interviews are a feasible means of collecting long-term functional outcomes data about trauma patients in sub-Saharan Africa.

Methods: We piloted a telephone-administered interview tool based on the Extended Glasgow Outcomes Scale (GOSE). Using departmental logbooks and trauma registries in two academic medical centers in an East African metropolis, 400 consecutive patients presenting with injuries were identified retrospectively. Patient telephone numbers and demographic and injury data were collected from clinical charts. When a telephone number was available, patients or their caretakers were contacted and interviewed about their functional status six months after their injuries.

Results: Of 400 patients, we were able to contact 189 patients or their caretakers, and 186 of those contacted were willing to complete the interview with allowing us to calculate a GOSE score (97%). Language barriers and patient refusal to participate were not significant barriers. At six months, 142 patients had made a good recovery (77%), 5 had made a moderate recovery (3%), 31 were severely disabled (17%), and 7 had died (4%). Of those who we were unable to contact, 70% did not have a phone number recorded and 30% had numbers that were not answered or were out of service.

Conclusion: This pilot study demonstrates that structured, GOSE-based, telephone-administered interviews are a feasible means of collecting long-term functional outcomes data about trauma patients in sub-Saharan Africa when a reliable telephone number has been recorded. Because patient follow-up is limited in this setting, this research methodology provides a valuable new means of collecting patient data following hospital discharge. These data are essential for understanding the true burden of injury in this context, where almost a quarter of trauma victims had significant persistent disability at six months. Future prospective studies using telephone-administered interviews should emphasize accurate telephone number collection prior to hospital discharge.

Session XXIV: WTC IV Session: Trauma Education
Paper 2: 5:00pm - 6:00pm

A PROSPECTIVE ANALYSIS OF SHORT AND MID-TERM KNOWLEDGE RETENTION AFTER AN ULTRA-SHORT ULTRASOUND COURSE FOR MEDICAL STUDENTS.

Carlos Augusto M. Menegozzo MD, Priscila G. Cazolari MD, Fernando C. Novo MD, Ramiro Colleoni MD,Ph.D., Edivaldo M. Utiyama MD,Ph.D., University of Sao Paulo

Introduction: Point-of-care ultrasound is becoming an invaluable tool in emergency surgery and is already considered as he new stethoscope by some authors. Ultrasound techniques may be taught early for medical students. FAST represents a simple exam that might be used to teach important aspects of ultrasound imaging. We sought to investigate knowledge retention on short- and mid-term after an ultra-short FAST course for medical students. As a secondary outcome, we persued to find what the students consider as barriers to participate in ultrasound courses.

Methods: This prospective study involved medical students enrolled to the FAST course of the Sao Paulo State Trauma Leagues Symposium, and included those who responded to a pre-course (PRT) questionnaire. The same 8-question form was presented 1 week (1POT) and 3 months (3POT) after the course. The course duration was 50 minutes and involved theoretical explanations and hands-on training. Correct responses obtained from the questionnaires were compared to assess knowledge gain with the course after 1 week, and the retention after 3 months. Statystical analysis was performed using Chi-square and Fisher's Exact tests, and a $p < 0.005$ was considered significant.

Results: Fifty-two students participated in the course. Thirty-seven answered the pre-course questionnaire (PRT) and were included in the analysis. Response rates to 1POT and 3POT were 47% and 32%, respectively. No student had previously participated in an ultrasound course. Comparison between PRT and 1POT showed that there was significant knowledge retention for 6 of the 8 questions (Table 1). Comparison in Table 2 showed that the acquired knowledge was retained, despite small reduction in correct answers. Regarding the barriers for undergoing an ultrasound course, students reported costs (65%), concerns about being released from routine activities (38%), course location (38%), and time spent in the course (24%) as the main factors.

Conclusion: this data show that even an ultra-short FAST course can effectively impact theoretical knowledge retention in medical students. Efforts should be made to disseminate this knowledge early during medical education. This should be made by customized courses with low costs, short duration, in accessible places and with previous consent from the university directors.

Table 1. Comparison between PRT and 1POT responses.

	PRT (n= 37)	1POT (n = 18)	p-value
Q1. Basic ultrasound functionality	26 (70%)	15 (83%)	0,346
Q2. Transducer choice	28 (78%)	15 (83%)	0,731
Q3. FAST steps	27 (73%)	18 (100%)	**0,021**
Q4. E-FAST windows	10 (27%)	13 (72%)	**0,001 ***
Q5. Ultrasound vs. Chest X-ray	6 (17%)	10 (55%)	**0,004**
Q6. Free Fluid Identification	8 (22%)	12 (66%)	**0,001 ***
Q7. Hepatorenal evaluation	8 (22%)	13 (72%)	**<0,001 ***
Q8. Pericardial evaluation	2 (6%)	12 (66%)	**<0,001**

Table 2. Comparison between PRT and 1POT responses.

	1POT (n = 18)	3POT (n= 12)	p-value
Q1. Basic ultrasound functionality	15 (83%)	10 (83%)	0,999
Q2. Transducer choice	15 (83%)	10 (83%)	0,999
Q3. FAST steps	18 (100%)	10 (83%)	0,152
Q4. E-FAST windows	13 (72%)	8 (66%)	0,999
Q5. Ultrasound vs. Chest X-ray	10 (55%)	7 (58%)	0,999
Q6. Free Fluid Identification	12 (66%)	5 (41%)	0,119 *
Q7. Hepatorenal evaluation	13 (72%)	5 (41%)	0,094 *
Q8. Pericardial evaluation	12 (66%)	6 (50%)	0,361*

Session XXIV: WTC IV Session: Trauma Education
Paper 3: 5:00pm - 6:00pm

PREPARED TO CARE: AN EXPLORATION OF CONTINUING EDUCATION TRENDS OF NURSES CARING FOR INJURED CHILDREN

Linda N. Roney RN, EdD EGAN School Of Nursing And Health Studies

Introduction: The significance of nursing competence in the care of pediatric trauma patients has been well documented (AAP, 2016). Continuing education for trauma nurses is an important component of maintaining competence yet there is significant variability in the resources used to support this goal. The purpose of this current study was to explore the types of educational programs and requirements that members of the Society of Trauma Nurses (STN) must complete to work in verified/ designated trauma centers. Trauma nursing education requirements by state and selected countries (Canada and Norway) are also presented.

Methods: A descriptive non-experimental research design was utilized to describe the educational programs that members of the Society of Trauma Nurses (STN) must complete to work in verified/designated trauma centers. An invitation to participate in this study was sent to all (2990) members of STN during May 2017. Participants completed a 15-question survey instrument that included questions about demographics, pediatric trauma educational programs required/offered by their employer, and feedback about pediatric trauma nursing education.

Results: A total of 265 responses were included in this current study. Most participants worked at community hospitals (n= 78; 30%) followed by those working at children's hospitals within larger medical centers (n=45; 17%) and free-standing children's hospitals (n=45; 17%). Most worked in an adult trauma centers with county/ state verification/ designation as an adult trauma center (n=68; 26%) or an ACS verified adult trauma center (n=62; 23%). Two international member responses were received. Most participants were trauma program managers/coordinators (n=131) and a wide-variety of other nursing roles were represented. Most participants reported (n=186; 70%) that their verifying/ designating agency required trauma nursing education to support their trauma center. Trauma Nurse Core Curriculum (TNCC) was the most popular educational course required by members' employers (n=208; 79%) followed by Pediatric Advanced Life Support (n=194; 73%) and Emergency Nursing Pediatric Course (ENPC) (n=101; 38%). Course in Advanced Trauma Nursing (n=2) and International Trauma Life Support (ITLS) Pediatric (n=1) and ITLS Provider (n=1) were least common. Participants provided feedback about challenges accessing pediatric-specific trauma nursing education; operational and budgetary limitations of requiring pediatric trauma continuing education that is not required by trauma verifying/designating organizations; limited pediatric trauma content in established trauma courses offered by professional nursing organizations; and suggestions to include additional content about non-accidental trauma in pediatric trauma nursing education offerings.

Conclusion: While there is strong support for continuing education in pediatric trauma nursing for all nurses who care for injured children, there is a lack of consensus with regards to standards in programming, content and the amount of time that should be spent in learning activities. Many hospitals continue to expend resources in developing programs for their own institution often due to the limitations related to not being able to endorse a program because it is not mandated by a verifying/designating agency. In addition to high-quality programming developed by professional nursing organizations, some regional and state trauma systems have developed continuing education programs for nurses that include evidenced-based pediatric content that could also serve as a model.

Session XXIV: WTC IV Session: Trauma Education
Paper 4: 5:00pm - 6:00pm

ESTABLISHMENT OF TRAUMA SYSTEM FRAMEWORK IN SHENZHEN, CHINA

GUIXI ZHANG BS, MBBS MHSM MTS, Joe K. FAN BS, MS, Gilberto K. LEUNG BS,Ph.D., MS, Hong ZHANG BS,MD, Xiaohua PAN MD,Ph.D., Chung Mao LO BS,MD, Lianyang ZHANG BS,MD, Ronald V. MAIER MD, FACS FRCS Ed (Hon)
Medical School Of Chinese PLA

Introduction: The trauma triage in Shenzhen is currently sending trauma patients to the nearest hospital, and has caused some major trauma patients to be sent to hospitals where they do not have appropriate resources and capacity for treatment. The study performed in 2016 showed patients who are considered to have suffered a major trauma, from scene to hospital, as 8.5% were taken to a teaching hospital, 13.6% to a regional hospital, 42.6% to a community hospital and 35.3% to a private hospital.

Methods: A geographical analysis of traumatic accidents happened in Shenzhen in 2014 and the results showed that trauma patients were highly clustered. A multi-party group was formed to discuss the feasibility and rationality of designated hospitals for trauma patients based on traumatic accidents location, hospital location, hospital level, previous trauma patient volume and trauma care resources. The recommendation of the regional trauma centers among these hospitals will depend on hard and soft criteria.

Results: A consensus has been formed that trauma patients need to be sent to designated hospitals. 22 hospitals were designed to be trauma care hospitals that cover the entire population throughout the Shenzhen area. Five trauma networks were suggested to be established and five hospitals were designed to be regional trauma centers that are expected to meet all the hard and soft criteria by December 31, 2018.

Conclusion: The rationale behind the Shenzhen Trauma System Framework is to ensure that the right patient goes to the right hospital at the right time, to receive the right care under the right organization, in order to achieve the right result. This framework will provide experiences for other parties in China to refer to, and it may provide a model for other parties in China to follow as well, in the near future.

Key words: Geographical Analysis; Designation; Trauma Center

Session XXIV: WTC IV Session: Trauma Education
Paper 5: 5:00pm - 6:00pm

WORLD TRAUMA EDUCATION: HEMORRHAGE CONTROL TRAINING FOR HEALTHCARE PROVIDERS IN INDIA

Lindsay A. Smith BA, Sarah Caughey BA, Susan Liu BSN, RN, Cassandra Villegas MD, MPH, Robert Winchell MD, Mohan Kilaru MD, Mayur Narayan MD, MPH, MBA, MHPE Weill Medical College of Cornell University

Introduction: Hemorrhage remains a major cause of death around the world. Eighty percent of trauma patients in India do not receive medical care within the first hour. The etiology of these poor outcomes is multifactorial. To date, there has only been one documented first-responder civilian training course for basic trauma care in India. The first Stop the Bleed (StB) course was recently offered to a group of medical providers in India.

Methods: A cross-sectional survey of 101 participants who attended a StB training in Puttaparthi and Bangalore, India was performed. Ninety-six participants were healthcare providers and five were laypersons, ages 19 to 75 y.o. Pre- and post-training questionnaires were collected from each participant (5-point Likert scale). Data from the five laypersons was excluded, along with that of eight healthcare providers whose questionnaires were incomplete. In total, 88 healthcare providers' pre- and post-training questionnaires were included in the analysis. Training time was distributed evenly between didactic and skills sessions. Three bleeding control skills were presented: wound compression, wound packing, and tourniquet application.

Results: Among participants, 88.6% had previously taken a CPR or first-aid training course. Only 23.9% reported receiving bleeding control training. The 88 healthcare providers consisted of nine resident physicians (10.2%), 24 attending physicians (27.3%), and 55 nurses (62.5%). Participants who reported feeling "extremely confident" responding to an emergency medical situation rose from 68.2% prior to StB training to 94.3% post-training. Regarding hemorrhage control abilities, 37.5% felt extremely confident before the training, compared to 95.5% after the training. For wound packing and tourniquet application, 44.3% and 53.4%, respectively, felt extremely confident pre-training, followed by 97.7% for both skills post-training. Importantly, 90.9% of StB trainees felt comfortable teaching newly acquired hemorrhage control skills, as all of the physicians and nurses who completed this course were certified as StB instructors. The training was well received, with 96.6% stating they would recommend the course to others. When evaluating instructional equipment, 95.5% and 94.3% of participants stated that confidence in their wound packing and tourniquet skills would improve with a more realistic mannequin. Additionally, seven trainees requested supplementary videos or real-life scenarios/case discussions where these skills could be used. Lastly, three participants suggested translation of this program into local languages.

Conclusion: To our knowledge, this is the first StB training in India. Disparities in access to care, long transport times, and insufficient numbers of prehospital personnel contribute to the nation's significant trauma burden. Dissemination of these critical lifesaving skills into this region and the resulting civilian interventions will increase the number of trauma patients who survive long enough to reach a trauma center. Much more work is needed to match the training required for the large population. Additionally, considerations should be given to translating the course into local languages to increase program reach.

WTC 24: Prehospital **Sponsored by JSACS/KSACS**

Location: Old Town, Second Level (Seaport Tower)

Moderators: Susan Brundage, MD, MPH and John Cook-Jung Lee, MD, England and South Korea

Keynote: John Cook-Jung Lee, MD, Invasive Prehospital Care

ASSESSMENT OF POLYTRAUMATIZED PATIENTS ACCORDING TO THE BERLIN DEFINITION: DOES THE ADDITION OF PHYSIOLOGICAL DATA REALLY IMPROVE INTEROBSERVER RELIABILITY?
Presenter: Carina Pothmann, MD, Switzerland

PHYSICIAN BASED ON-SCENE AIRWAY MANAGEMENT IN SEVERELY INJURED PATIENTS AND IN-HOSPITAL CONSEQUENCES - IS THE MISPLACED INTUBATION AN UNDERESTIMATED DANGER IN TRAUMA MANAGEMENT?
Presenter: Orkun Özkurtul, MD, Germany

DEVELOPMENT OF TRAUMA LEVEL PREDICTION MODELS UTILIZING EMS VITAL SIGNS TO REDUCE OVER- AND UNDERTRIAGE RATES FOR PENETRATING WOUNDS AND ELDERLY FALLS
Presenter: Robert Riggs, PhD, USA

THE STATE OF PRE-HOSPITAL CARE AND AMBULANCE UTILIZATION IN RURAL GUJARAT, INDIA
Presenter: Maunil Bhatt, MD, BS, USA

EMERGENT TRAUMA LAPAROTOMY WITH OR WITHOUT THORACOTOMY IN THE EMERGENCY DEPARTMENT: RISKS AND BENEFITS.
Presenter: Kaori Ito, MD, Japan

Session XXIV: WTC IV Session: Prehospital
Paper 1: 5:00pm - 6:00pm

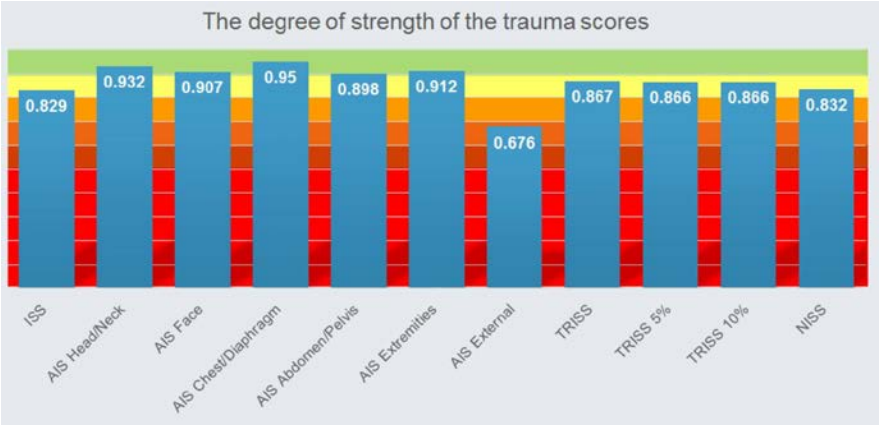
Assessment Of Polytraumatized Patients According To The Berlin Definition: Does The Addition Of Physiological Data Really Improve Interobserver Reliability?

Carina E. Pothmann MD, Kai O. Jensen MD, Ladislav Mica MD, Georg Osterhoff MD, Hans P. Simmen MD, Kai Sprengel MD, University Hospital Zurich

Introduction: Several new definitions for categorizing the severely injured as the Berlin Definition have been defined. Here, severely injured patients are selected by additive physiological parameters and by the general Abbreviated Injury Scale (AIS)-based assessment. However, all definitions should conform to a AIS severity coding applied by an expert. We examined the dependence of individual coding on defining injury severity in general and in identifying polytrauma according to several definitions.

Methods: We investigated the interobserver reliability (IR) between several trauma-scoring systems (AIS, Injury Severity Score [ISS], New ISS [NISS], and The Trauma and Injury Severity Score [TRISS]) for identifying polytrauma using several cutoff levels (ISS ³16, ³18, ³20, and the Berlin Definition). Three hundred and nineteen patients were included for analyzing IR of trauma scores, with 187 for polytrauma definitions. IR for scoring was assessed by intraclass correlation coefficient Cronbach's alpha (ICC) and Cohen's kappa for the polytrauma definitions.

Results: IR showed good agreement (³0.80) with ISS, NISS, maximum AIS of each body region (MAIS; with the exception of MAISexternal), and TRISS. IR for identifying polytrauma according to the relevant definitions showed moderate agreement (<0.60) in the ISS cutoff categories (ISS ³16, ³18, and ³20), while the Berlin Definition demonstrated a correlation of >0.81.



Conclusion: Compared with the ISS-based definitions of polytrauma, the Berlin Definition proved less dependent on the individual rater. This underlines the need to redefine the selection of severely injured patients. Using the Berlin Definition for identifying polytrauma could improve the comparability of patient data across studies, in trauma center benchmarking, and in quality assurance.

Session XXIV: WTC IV Session: Prehospital
Paper 2: 5:00pm - 6:00pm

PHYSICIAN BASED ON-SCENE AIRWAY MANAGEMENT IN SEVERELY INJURED PATIENTS AND IN-HOSPITAL CONSEQUENCES - IS THE MISPLACED INTUBATION AN UNDERESTIMATED DANGER IN TRAUMA MANAGEMENT?

Orkun Özkurtul MD, Johannes K. Fakler MD, Tonja Weber MD, Christoph Josten MD,Ph.D., Unversity Hospital Leipzig

Introduction: Establishing and maintaining an adequate airway by endotracheal intubation (ETI) is an essential component of advanced trauma life support (ATLS ®) to ensure best possible oxygenation and ventilation. Orotracheal intubation remains the gold standard for securing a definitive airway in trauma care. When performed in the out-of-hospital environment special attention has to be paid to cervical spine protection, the risk of aspiration and possible sideeffects of analgesia and sedation. The aim of our study was to determine the influence of airway management associated problems on neurological outcome after out-of-hospital intervention by EMS physicians in patients suffering from severe and multiple injuries and the consequences for the trauma leader.

Methods: In this retrospective study (01/2011-12/2013), all patients admitted to the trauma room of a level I trauma center were analyzed consecutively. The subgroup of patients with advanced airway management in the out-of-hospital setting by EMS physician as inclusion criteria were investigated in detail. The incidence of unrecognized esophageal misplaced tube, endobronchial intubation and massive aspiration of stomach content were recorded as airway associated problems. The neurological outcome at hospital discharge was evaluated using the Glasgow Outcome Scale (GOS).

Results: During the study period 1,176 patients were admitted. Out of these, 151 patients received advanced airway management in the out-of-hospital setting. Airway associated problems were identified in 12 cases (8%). Esophageal intubation was recorded in 5 patients (3%) and other problems were identified in 5%. Airway associated problems was significant associated with vegetative state or severe disability (GOS 2/3) in 36,3%.

Conclusion: Out-of-hospital airway management problems may contribute to the neurological outcome of severe and multiple injured patients. Intensive and routine trauma and airway management trainings seem to be a prerequisite for successful trauma management. The trauma leader should consider airway associated pitfalls. Trauma room checklists may be a useful tool for avoiding life-threatening mistakes.

Session XXIV: WTC IV Session: Prehospital
Paper 3: 5:00pm - 6:00pm

DEVELOPMENT OF TRAUMA LEVEL PREDICTION MODELS UTILIZING EMS VITAL SIGNS TO REDUCE OVER- AND UNDERTRIAGE RATES FOR PENETRATING WOUNDS AND ELDERLY FALLS

Robert J. Riggs Ph.D., Sara Riggs Ph.D., Megan Byham MS, Morgan Witherspoon BS, Nathan Baugh BS, Ashley Metcalf RN, MSN, Debra Kitchens RN, MBA, John Cull MD, Benjamin Manning MD, Greenville Health System

Introduction: The process to determine the triage activation level can be difficult and inaccurate, resulting in excessive overtriage (OT) and undertriage (UT) rates. This study focuses on the development of trauma activation prediction models using field data to accurately predict trauma activation level and achieve triage rates that are consistently within The American College of Surgeons (ACS) recommended ranges.

Methods: We utilized the 2014 National Trauma Data Bank (NTDB) to create a binary regression equation for each injury type under study (geriatric patients with blunt injury from falling while standing (GF), and patients with penetrating wounds (i.e., gunshot and stab wounds)). The 2014 trauma data was randomized and divided into halves, where the first half of the data for each injury type was used to generate the prediction model, and the second half of the 2014 data, 2013, and 2015 NTDB data was used for model verification. The binary regression equations were generated from vital signs collected by EMS. Patients with any incomplete vital sign values or values outside required ranges were removed from the data set. A Cribari Grid with an ISS≥15 was used to determine appropriateness of activation level. Chi-square analysis was utilized to determine significant differences between OT, UT, and accuracy predictions.

Results: Using our triage models, we were able to obtain an UT rate of less than 4% and an OT rate of less than 40% for GF, an UT rate less than 4% and OT of less than 50% for patients suffering from gunshot wounds (GSW), and an UT rate less than 4% and OT rate less than 25% for patients suffering stab wounds.

Fall from Standing for Patients 65 Years and Older (GF)				
Data Set Year	**Sample Size**	**Overtriage % (95% CI)**	**Undertriage % (95% CI)**	**Accuracy % (95% CI)**
2014 Model	13125	37.03 (36.20, 37.86)	3.51 (3.20, 3.84)	59.46 (58.61, 60.30)
2014 Validation	13134	36.37 (35.55, 37.20)	3.43 (3.12, 3.75)	60.20 (59.36, 61.04)
2013	25821	36.47 (35.88, 37.06)	3.95 (3.72, 4.20)	59.58 (58.98, 60.18)
2015	40700	37.75 (37.28, 38.22)	3.23 (3.06, 3.41)	59.02 (58.54, 59.50)
Gunshot Penetrating Wounds (GSW)				
Data Set Year	**Sample Size**	**Overtriage % (95% CI)**	**Undertriage % (95% CI)**	**Accuracy % (95% CI)**
2014 Model	4253	46.77 (45.26, 48.28)	3.50 (2.97, 4.10)	49.73 (48.22, 51.24)
2014 Validation	4403	44.79 (43.31, 46.27)	3.84 (3.29, 4.45)	51.37 (49.89, 52.86)
2013	10134	44.29 (43.32, 45.26)	3.95 (3.58, 4.34)	51.77 (50.79, 52.74)
2015	13650	44.42 (43.58, 45.26)	3.46 (3.16, 3.78)	52.12 (51.28, 52.96)
Stab Penetrating Wounds (SW)				
Data Set Year	**Sample Size**	**Overtriage % (95% CI)**	**Undertriage % (95% CI)**	**Accuracy % (95% CI)**
2014 Model	4532	20.63 (19.46, 21.84)	3.49 (2.97, 4.06)	75.88 (74.61, 77.12)
2014 Validation	4476	21.36 (20.17, 22.59)	3.93 (3.38, 4.54)	74.71 (73.41, 75.98)
2013	9892	21.81 (21.00, 22.63)	3.67 (3.31, 4.06)	74.52 (73.65, 75.38)
2015	13044	21.76 (21.05, 22.48)	3.63 (3.31, 3.96)	74.62 (73.86, 75.36)

For GF, the UT rate for GF patients in 2013 was significantly different ($p=0.002$) from the 2014 Validation and 2015 data, and the OT rate for 2015 was significantly different from the 2013 and 2014 Validation data ($p<0.001$). For GSW, there were no significant differences for UT rates ($p=0.201$), but the OT rate for the 2014 Model was significantly different from the 2013 and 2015 data ($p=0.037$). For stab wounds, there were no significant differences for UT ($p=0.712$) or OT ($p=0.381$) rates.

Conclusion: Our developed trauma level prediction models enable health providers to predict trauma activation levels that result in over- and undertriage rates that fall in line with the recommended ranges by ACS.

Session XXIV: WTC IV Session: Prehospital
Paper 4: 5:00pm - 6:00pm

THE STATE OF PRE-HOSPITAL CARE AND AMBULANCE UTILIZATION IN RURAL GUJARAT, INDIA

Maunil Bhatt BS,MD, Mayur Shinde BS, M.Sc, Kandarp Talati BS,MPH, Ajay Phatak BS,MPH, Karthik Vishwanathan BS, MS, Somashekhar Nimbalkar BS,MD, Heena Santry MD, Boston University Medical Center

Introduction:Low and Middle income countries (LMICs) like India are going through rapid urbanization and have high injury associated mortality rates. Lack of infrastructure and resources has led to poor prioritization of pre-hospital care and 'Golden Hour'. In Gujarat, despite the recent implementation of a state sponsored ambulance service, its direct impact on outcomes in trauma patients has never been studied. We aimed to investigate the utilization of this ambulance service amongst trauma patients and its impact on mortality in rural western India.

Methods: Retrospective analysis of prospectively collected trauma registry data at an only tertiary care hospital serving a rural catchment area of 11,300 sq km in state of Gujarat, India was conducted between September 1, 2017 and January 15, 2018. Basic patient demographics, injury related details, pre-hospital data points and mortality were compared between patients arriving in an ambulance vs other modes of transport. Multivariable logistic regression models were used to determine the impact of mode of transport on patient mortality.

Results: Of 1,117 patients, majority (74%) were males, and mean age was 33.6 years (± 17.9). Only 364 (33%) patients utilized the ambulance service. Most patients (68%) were brought in either by their relatives or the bystanders in a private vehicle. Patients arriving by ambulance vs private vehicles were similar in age, gender, and time of injury. However, patients arriving in ambulance had lower overall revised trauma score (RTS) suggesting more severe injuries (7.47 vs 7.76, $p < 0.001$). The median ambulance response time was 17.5 minutes. Patients using ambulances had longer transport times (55 mins vs 45 mins, $p = 0.023$). Patients arriving >60 minutes had significantly higher mortality compared to shorter transport times (OR 9.17, 95% CI 2.12 - 39.71, $p = 0.003$). Despite the existing capabilities, the quality of basic pre-hospital care was poor especially for the critically injured patients. Zero endotracheal intubations were performed en route when necessary (GCS < 8), and 0 cervical spines were protected when indicated. Consequently, the adjusted mortality rate (by age, cause of injury and RTS) amongst patients transported in the ambulances was no better than in patients arriving by other modes of transport (aOR 1.92, 95% CI 0.50 - 7.38, $p = 0.338$). 319 (28%) patients initially went to the other hospitals which had inadequate capabilities to treat the sustained injuries and were eventually transferred to our hospital. For these inappropriately triaged patients, the median duration from the time of injury to definitive care was longer (160 vs 45 minutes, $p < 0.001$). Additionally, these patients had higher adjusted mortality rates (by age and cause of injury) [aOR 3.15, 95% CI 1.33 - 7.47, $p = 0.009$].

Conclusion: The use of ambulance by trauma patients in rural Gujarat remains poor. Ambulance transport is not associated with lower mortality, but on the contrary appears to take longer than private vehicles. Inappropriate triage in the field is common and is associated with increased mortality. Significant improvement in pre-hospital training and triage protocols may improve patient outcomes associated with ambulance transport of trauma patients in rural Gujarat.

Session XXIV: WTC IV Session: Prehospital
Paper 5: 5:00pm - 6:00pm

EMERGENT TRAUMA LAPAROTOMY WITH OR WITHOUT THORACOTOMY IN THE EMERGENCY DEPARTMENT: RISKS AND BENEFITS.

Kaori Ito MD, Kahoko Nakazawa MD,MPH, Tsuyoshi Nagao MD, Hiroto Chiba MD, Takashi Fujita* MD,Ph.D., Teikyo University School of Medicine

Introduction: Different from the level I trauma centers in the United States or other western countries, trauma centers in Japan don't mandate to have one operating room (OR) and one OR team to be available for 24 hours/7 days for emergent trauma surgery. Therefore, our emergency department (ED) in the advanced trauma center have trauma resuscitation rooms with OR set-up which allow surgeons to perform trauma laparotomy/thoracotomy without transferring patients to the OR. This study was conducted to assess the risks and benefits of this practice pattern.

Methods: Patients who underwent emergent trauma surgery by our acute care surgery group (4/2013 – 12/2017) were reviewed. Patients' demographics, injury severity score (ISS), location of surgery, type of surgery, time from admission to surgery, vital signs (at the scene, on admission, and prior to surgery), preoperative interventions, transfusions, postoperative outcomes, and in-hospital mortality were recorded. For patients who underwent surgery in the ED, risk factors associated with the in-hospital mortality were analyzed.

Results: There were 121 patients who met inclusion criteria. There were 64 patients (53%, 64/121) who underwent surgery in the ED and 57 patients (47%, 54/121) in the OR. The mean ISS was higher in the ED group than OR group (31.0±16.1 vs 13.9±10.1, p=0.04). Patients who underwent surgery within 90 minutes from admission were more frequent in the ED group than the OR group (72%, 46/64 vs 35%, 20/57, p<0.01). The in-hospital mortality rate was 36% (23/64) in the ED group; whereas, there were no mortality in the OR group (p<0.01). Outcomes of 59 patients in the ED who had signs of life on admission were shown on Table 1. Blunt trauma and shock (systolic blood pressure [SBP] < 90 mmHg) were more common in patients who died than who survived. Time from admission to surgery were not different between who died and who survived. Patients who died received more transfusions of red blood cells (RBCs) and platelets than patients who survived. Among patients who died, there were 12 patients (67%, 12/18) who were not shock on admission and 7 patients (50%, 7/18) who developed shock after induction of anesthesia. All patients (100%. 5/5) who underwent laparotomy followed by thoracotomy died in the ED. All patients (100%, 5/5) who needed the placement of resuscitative endovascular balloon occlusion of aorta (REBOA) died. Twelve patients (67%, 12/18) died in the ED following surgery. Among patients who survived, 30 patients (73%, 30/41) were not shock prior to surgery (Table 1).

Conclusion: Emergent trauma surgeries in the ED were associated with shorter time from admission to surgery, higher ISS, larger amount of transfusions, and higher mortality compared to surgeries in the OR. There were some concerns regarding pre- and intra-operative anesthetic management in surgeries in the ED. Patients who died in the ED following surgery might not be survivable regardless of the timing of surgery nor the place of surgery. Patients who were not shock prior to surgery could have been brought to the OR. Further study is warranted to assess the safety of this practice pattern.

Table 1: Outcomes patients with signs of life on admission and who underwent emergent trauma surgery in the ED (N=59)

	Survived (N=41)	Died (N=18)	P value
Age, years, mean±SD	47.1±22.8	41.7±18.8	0.39
Injury Severity Score, mean±SD	22.8±13.4	38.6±15.0	0.68
Blunt trauma	20 (49%)	17 (94%)	<0.01
Time from admission to surgery > 90 minutes	28 (68%)	13 (72%)	0.78
Shock (SBP <90mmHg) at scene	9 (22%)	6 (33%)	0.52
Shock (SBP <90mmHg) on admission	8 (20%)	6 (33%)	0.32
Shock (<90mmHg) prior to surgery	11 (27%)	11 (61%)	0.02
Shock after the induction of anesthesia	11 (27%)	9 (50%)	0.13
Preoperative REBOA placement	0	5 (28%)	<0.01
Type of surgery: Laparotomy	18 (44%)	4 (22%)	0.15
Type of surgery: Thoracotomy	1 (2%)	1 (2%)	0.52
Type of surgery: Laparotomy then thoracotomy	0	5 (28%)	<0.01
Type of surgery: Thoracotomy then laparotomy	1 (2%)	1 (6%)	0.52
Type of surgery: Retroperitoneal pelvic packing	2 (5%)	5 (28%)	<0.01
Type of surgery: Others	19 (46%)	2 (11%)	0.02
Transfusion of RBCs within 24 hours, units, mean±SD	8.8±12.9	27.2±21.6	0.02
Transfusion of FFPs within 24 hours, units, mean±SD	8.8±12.5	16.6±16.3	0.10
Transfusion of Platelets within 24 hours, units, mean±SD	8.2±12.7	14.7±17.2	0.02

77th Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery

4th World Trauma Congress

OTA/ DGOA Schedule

September 26-29, 2018 • San Diego, CA

***All activities will take place in Mission Beach (3rd Floor) unless otherwise indicated**

Friday 9/28

7:00-8:30 am — Breakfast
Location: Harbor Ballroom (2nd Floor)

8:00-8:15 am — Introduction & Welcome

8:15-10:30 am
Emergencies in Trauma

- Pelvic Fracture with Shock
  Phillip Wolinsky, MD/OTA and Ingo Marzi, MD/DGOU
- Compartment Syndrome
  Todd Swenning, MD/OTA and Raul Coimbra, MD, PhD
- Open Fractures
  Alexandra Schwartz, MD/OTA and Radko Komadina, MD/DGOU
- Unreduced Dislocations
  Douglas Lundy, MD

10:30-10:45 am — Break

10:45 am-12:00 pm
Damage Control Orthopaedic Surgery

- Timing
  Charles Moon, MD/OTA and Zsolt Balogh, MD/DGOU
- Injuries to Treat Immediately
  Philip Wolinsky, MD/OTA and Christoph Josten, MD/DGOU
- Staged Procedures
  Jeffrey Smith, MD/OTA and Hans-Christoph Pape, MD/DGOU

12:00-1:00 pm — Lunch (on own)

1:00-2:20 pm

Prevention/ Management Complications

- Infection
  Alexandra Schwartz, MD/OTA and Hans-Christoph Pape, MD/DGOU
- Post-operative/rehabilitation issues
  Jeffrey Smith, MD/OTA and Bertil Bouillon, MD/DGOU

2:00-4:00 pm

Injury Updates

- Femoral shaft fractures
  Philip Wolinsky, MD/OTA and Hans-Christoph Pape, MD/DGOU
- Tibial shaft fractures
  Todd Swenning, MD/OTA and Radko Komadina, MD/DGOU
- Articular elbow fractures
  Alexandra Schwartz, MD/OTA and Christoph Josten, MD/DGOU
- Articular knee injuries
  Jeffrey Smith, MD/OTA and Bertil Bouillon, MD/DGOU
- Articular ankle injuries
  Todd Swenning, MD/OTA and Zsolt Balogh, MD/Radko Komadina, MD/DGOU

4:00-5:00 pm

Management of Bone Defects

- Bone graft options
  Charles Moon, MD/OTA and Ingo Marzi, MD/DGOU
- Distraction osteogenesis
  Douglas Lundy, MD/OTA and Christoph Josten, MD/DGOU

5:00 pm Conclude

77th Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery

4th World Trauma Congress

Society of Trauma Nurses Schedule

September 26-29, 2018 • San Diego, CA

Wednesday 9/26

***All activities will take place in Mission Beach (3rd Floor) unless otherwise indicated**

7:00-8:30 am — Breakfast
Location: Seaport Foyer (2nd Floor)

8:00-10:40 am — STN International Council Meeting and other STN Committee Meetings
Location: Cortez Hill A (3rd Floor)

1:00-5:00 pm

Back to Basics: The Nuts and Bolts of Building Your Trauma Center

Speakers:
Susan Auerbach, MSH, RHIA
Cindy Blank-Reid, MSN, RN
Sean Elwell, MSN, RN
Heidi Hotz, BSN, RN
Sarah Mattock, MSN, RN
Linda Reinhart, MSN, RN

- *Basic Trauma Registry Needs*
- *Leadership Skills*
- *Starting a Performance Improvement Program*
- *Nursing and Physician Education Standards*

Thursday 9/27

6:15-7:15 am
International Nursing Panel-Trauma Care in My Corner of the World

Speaker: Knut Magne Kolstadbraaten, RN

- Europe
- South America
- Asia
- Africa
- Oceania
- North America

7:30-8:30 am
A World Wide Issue-Family Violence

Speaker: Helen Jowett, RN

8:35-9:30 am
Injury-A Neglected Global Health Priority

Speaker: Rochelle Dicker, MD

10:00-11:00 am
Neuro Trauma Care – the Amazing Race to Save Lives

Speaker: Linda Littlejohns, MSN, RN, CNRN, FAAN

12:30-1:30 pm
International Nursing Panel – Caring for the World's Aging Population

Speaker: Knut Magne Kolstadbraaten, RN

- Europe
- South America
- Asia
- Africa
- Oceania
- North America

2:15-2:45 pm
International Nurses Experience with American College of Surgeons Committee on Trauma Verification Process: A Pilot Project

Speakers:
Jessica Badillo, MSN, RN
Lisa Falcon, MSN, RN, TCRN, Ne-BC
Gregory Peck, MD

3:00-4:00 pm
Life After Trauma: Rehabilitation and Afterwards

Speaker: Jerome Stenehjem, MD

4:00-5:00 pm
STN Reception (Nurses ONLY)

AAST INFORMATION

BOARD OF MANAGERS 2017–2018

President.....Michael F. Rotondo, M.D.
Rochester, New York

President-Elect.....Martin A. Croce, M.D.
Memphis, Tennessee

Vice-President.....James W. Davis, M.D.
Fresno, California

Secretary-Treasurer.....Eileen M. Bulger, M.D.
Seattle, Washington

Recorder and Program Chairman.....Patrick Reilly, M.D.
Philadelphia, Pennsylvania

Past President 2014–2015.....Thomas M. Scalea, M.D.
Baltimore, Maryland

Past President 2015–2016.....Grace S. Rozycki, M.D.,M.B.A
Edgewater, Maryland

Past President 2016–2017.....Raul Coimbra, M.D.,Ph.D.
San Diego, California

Manager-at-Large (2018).....David H. Livingston, M.D.
Newark, New Jersey

Manager-at-Large (2019).....Raminder Nirula, M.D., Ph.D.
Salt Lake City, Utah

Manager-at-Large (2020).....Sharon Henry, M.D.
Baltimore, Maryland

Critical Care Manager-at-Large (2018).....Karen J. Brasel, M.D., M.P.H
Portland, Oregon

Acute Care Surgery Manager-at-Large (2020).....Clay Cothren Burlew, M.D.
Denver, Colorado

REPRESENTATIVES OF THE AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA

2017–2018

REPRESENTATIVE TO THE AMERICAN BOARD OF SURGERY
Amy Goldberg, M.D. (2012–2024)
Philadelphia, Pennsylvania

REPRESENTATIVE TO THE BOARD OF GOVERNORS OF THE AMERICAN COLLEGE OF SURGEONS
Therese M. Duane, M.D., M.B.A. (2012–2018)
Fort Worth, Texas

Kimberly A. Davis, M.D., M.B.A. (2013–2019)
New Haven, Connecticut

THE ABS TRAUMA, BURNS & CRITICAL CARE COMPONENT BOARD
Joseph P. Minei, M.D., M.B.A (2016–2022)
Dallas, Texas

Kimberly A. Davis, M.D., M.B.A. (2018–2024)
New Haven, Connecticut

REPRESENTATIVE TO THE AMERICAN ASSOCIATION OF BLOOD BANKS
Colonel John B. Holcomb, M.D. (2007–2018)
Houston, Texas

REPRESENTATIVE TO THE ADVISORY COUNCIL FOR GENERAL SURGERY THE AMERICAN COLLEGE OF SURGEONS
Michael Chang, M.D. (2013–2019)
Winston-Salem, North Carolina

REPRESENTATIVE TO THE WORLD HEALTH ORGANIZATION
Raul Coimbra, M.D., Ph.D. (2012–2018)
San Diego, California

ARCHIVIST
Basil A. Pruitt, Jr., M.D. (1996–)
San Antonio, Texas

AAST COMMITTEES 2017–2018

OPERATING COMMITTEES

ACUTE CARE SURGERY COMMITTEE

Clay Cothren Burlew, MD, Chair (2020)
Stephanie Savage, MD, Vice-Chair (2020)
Paula Ferrada, MD (2018)
Oliver Gunter, MD (2018)
Addison May, MD (2018)
Nicole Stassen, MD (2018)
Gary Vercruysse, MD (2018)
Brian Eastridge, MD (2019)
Joseph Galante, MD (2019)
Peter Rhee, MD, MPH (2019)
Preston Miller, MD (2019)
Joseph Rappold, MD (2019)
Richard Miller, MD (2019)
A. Britton Christmas, MD, (2020)
Christopher Dente, MD, (2020)
Alicia Mohr, MD, (2020)
D'Andrea Joseph, MD (2020)
Daniel Yeh, MD (2020)
Eric Toschlog, MD, (2020)
March de Moya, MD (2020)
Nathan Mowery, MD (2020)
Thomas Scalea, MD, *Ex-Officio (2018)*
Kimberly Davis, MD, MBA, *Ex-Officio* (2018)
Grace S. Rozycki, MD, MBA, Ex-Officio (2019)
Eileen Bulger, MD, *Ex-Officio (2019)*
David Lindsey, MD, *Ex-Officio* (2020)
Raul Coimbra, MD, PhD, Ex-Officio (2020)
John Fildes, MD, *ACS Program Directors Chair (2018)*

PROGRAM DIRECTORS SUBCOMMITTEE
of the Acute Care Surgery Committee

John Fildes, MD, Chair
James Davis, MD
Indermeet Bhullar, MD
Clay Cothren Burlew, MD
Bryan Cotton, MD
Jose Diaz, MD
Christopher Dente, MD
Andrew Doben, MD
Mark Falimirski, MD
Alicia Mohr, MD
Addison May, MD
Linda Maerz, MD
Nathan Mowery, MD
Jason Sperry, MD, MPH
Eric Toschlog, MD
Mbaga Walusimbi, MD, MSc
Jonathan Gates, MD
David King, MD
Narong Kulvatunyou, MD
Ronald Sing, MD, DO

CRITICAL CARE COMMITTEE

Karen Brasel, MD, MPH, Chair (2019)
Alexander Axelrad, MD (2018)
Richard Bagdonas, MD (2018)
Susan Evans, MD (2018)
Wendy Greene (2018)
Michaela West, MD, PhD (2018)
Sonlee West, MD (2018)
Joseph Cuschieri, MD (2019)
Dennis Kim, MD (2019)
Christopher Michetti, MD (2019)
Niels Martin, MD (2019)
Krishnan Raghavendran, MD (2019)
Addison May, MD (2020)
Christine Cocanour, MD (2020)
David Gourlay, MD (2020)
David Zonies, MD, MPH (2020)
Heather Dolman, MD (2020)
John Agapian, MD (2020)
Matthew Lissauer, MD (2020)
Melvin Stone Jr, MD (2020)
Panna Codner, MD (2020)
Pauline Park, MD (2020)
Rachael Callcut, MD (2020)
Ronald Simon, MD (2020)
Travis Polk, MD (2020)
Charles Adams, Jr., MD, *SCCPDS Representative (2018)*

EDUCATIONAL DEVELOPMENT/MOC COMMITTEE

Stephen Barnes, MD, Chair (2020)
Mark Bowyer, MD, Vice-Chair (2020)
Carlos Brown, MD (2018)
Tomas Jacome, MD (2018)
Randeep Jawa, MD (2018)
Matthew Martin, MD (2018)
Susan Steinemann, MD (2018)
Jose Diaz, MD (2019)
Devashish Anjaria, MD (2019)
Mark Seamon, MD (2019)
Andre Campbell, MD (2019)
Nicole Stassen, MD (2019)
Martin Schreiber, MD (2019)
Linda Maerz, MD (2019)
Susan Rowell, MD (2019)
Bellal Joseph, MD (2020)
Elizabeth Benjamin, MD, PhD (2020)
Glen Tinkoff, MD (2020)
Jamie Coleman, MD (2020)
Paul Schenarts, MD (2020)
Thomas Weiser, MD (2020)

GERIATRIC TRAUMA/ACS COMMITTEE

Deborah Stein, MD, MPH, Chair (2020)
Jody DiGiacomo, MD, Vice-Chair (2020)
Soumitra Eachempati, MD (2018)
Anne Mosenthal, MD (2018)
John Owings, MD (2018)
Kenji Inaba, MD (2019)
A. Tyler Putnam, MD (2019)
Abhijit Pathak, MD (2019)
David Lindsey, MD (2019)
Stanley Kurek, MD (2019)
Jay Yelon, MD, DO (2019)
Patrick Bosarge, MD (2019)
Orlando Kirton, MD, MBA (2019)
Alexander Axelrad, MD (2020)
Aurelio Rodriguez, MD (2020)
Bellal Joseph, MD (2020)
Carrie Sims, MD (2020)
David Livingston, MD (2020)
Jennifer Hubbard, MD (2020)
Matthew Carrick, MD (2020)
Rosemary Kozar, MD,PhD (2020)
Sasha Adams, MD (2020)
Scott Armen, MD (2020)
Toan Huynh, MD (2020)
Zara Cooper, MD, MSc (2020)
Todd Costantini, MD, *Ex-Officio, MIT Representative* (2020)
Robert Barrco, MD, MPH *Ex-Officio (2018)*

INTERNATIONAL RELATIONS COMMITTEE

Michel Aboutanos, MD, Chair (2020)
Rochelle Dicker, MD, Vice Chair (2020)
Gerardo A. Gomez, MD (2018)
Weidun Alan Guo, MD, PhD (2018)
Christopher Salvino, MD (2018)
Ronald Simon, MD (2018)
Mamta Swaroop, MD (2018)
A. Peter Ekeh, MD (2019)
Li Hsee, MD (2019)
Timothy Fabian, MD (2019)
Pal Naess, MD, PhD (2019)
Susan Brundage, MD,MPH (2019)
Nirav Patel, MD (2019)
Jana MacLeod, MD (2019)
Akio Kimura, MD (2019)
Ari Leppaniemi, MD, PhD (2020)
Eric Voiglio, MD, PhD (2020)
Gustavo Fraga, MD, PhD (2020)
Marc de Moya, MD (2020)
Mauro Zago, MD (2020)
Ruben Peralta, MD (2020)

INTERNATIONAL SOCIETY REPRESENTATIVES
of the International Relations Committee (two representatives from each)

European Society for Trauma and Emergency Surgery (ESTES)
Trauma Association of Canada (TAC)
Pan American Trauma Society (PTS)
World Society of Emergency Surgery
International Association for Trauma (IAT)
Trauma Society of South Africa
Surgery and Intensive Care (SIC)

MILITARY LIAISON COMMITTEE

Joseph Galante, MD, Chair (2020)
Jennifer Gurney, MD, Vice Chair (2019)
Eric Bradburn, DO (2018)
Kevin Dwyer, MD (2018)
Stacy Shackelford, MD (2019)
Juan Asensio, MD (2019)
Nichole Ingalls, MD (2019)
Sid Brevard, MD (2019)
Warren Dorlac, MD (2019)
Matthew Wall, Jr., MD (2019)
Joseph DuBose, MD (2019)
William Bromberg, MD (2019)
Alec Beekley, MD (2020)
Daniel Grabo, MD (2020)
David Zonies, MD, MPH (2020)
Kirby Gross, MD (2020)
Peter Rhee, MD (2020)
R. Stephen Smith, MD (2020)
Matthew Matin, MD (2021)
M. Margaret Knudson, MD, *ACS Liaison*

MULTI-INSTITUTIONAL TRIALS COMMITTEE

Todd Costantini, MD, Chair (2020)
Jose Pascual Lopez, MD, Vice-Chair (2020)
Dennis Ashley, MD (2018)
Juan Duchesne, MD (2018)
John Holcomb, MD (2018)
Nicholas Namias, MD, MBA (2018)
Martin Zielinski, MD (2018)
Gregory Victorino, MD (2019)
Oscar Guillamondegui, MD, MPH (2019)
Ajai Malhotra, MD (2019)
Nathan Mowery, MD (2019)
Brandon Bruns, MD (2020)
Bryan Morse, MD (2020)
Grant Bochicchio, MD, MPH (2020)
Hasan Alam, MD (2020)
Joseph DuBose, MD (2020)
Kenji Inaba, MD (2020)
Lance Stuke, MD, MPH (2020)
Matthew Lissauer, MD (2020)
Michael Cripps, MD (2020)
Scott Brakenridge, MD (2020)
Jason Sperry, MD, MPH *Ex-Officio* (2020)
Raul Coimbra, MD, PhD *Ex-Officio* (2020)
Mitchell Cohen, MD, WTA MIT Chair, *Ex-Officio*

PATIENT ASSESSMENT COMMITTEE

Marie Crandall, MD, MPH, Chair (2020)
Gail Tominaga, MD, Vice-Chair (2020)
Joaquim Havens, MD (2018)
Lawrence Lottenberg, MD (2018)
Babak Sarani, MD (2018)
Stephanie Savage, MD (2018)
Kevin Schuster, MD, MPH (2018)
Alan Tyroch, MD (2018)
Ali Salim, MD (2019)
Chris Cribari, MD (2019)
Ronald Simon, MD (2019)
Kristan Staudenmayer, MD, MSc (2019)
Leonard Weireter, MD (2019)
James Davis, MD (2019)
Daniel Holena, MD (2020)
David Efron, MD (2020)
Garth Utter, MD (2020)
Haytham Kaafarani, MD (2020)
James Booker, MD (2020)
Krista Kaups, MD, MSc, MS (2020)
Michelle McNutt, MD (2020)
Robert Martin, MD (2020)
Toby Enniss, MD (2020)

PEDIATRIC TRAUMA SURGERY COMMITTEE

Richard Falcone, Jr., MD, Chair (2019)
David Notrica, MD, Vice-Chair (2019)
Lydia Lam, MD (2018)
Errington Thompson, MD (2019)
Nilda Garcia, MD (2019)
M. Margaret Knudson, MD (2019)
Denis Bensard, MD (2019)
Steven Moulton, MD (2019)
Robert Letton, MD (2019)
Jeremy Cannon, MD (2019)
Jonathan Groner, MD (2019)
R. Todd Maxson, MD (2019)
Chris Newton, MD (2019)
John Bilello, MD (2019)
James Betts, MD (2019)
L.R. Tres Scherer III, MD (2019)
John Hall, MD (2019)
Stephen Megison, MD (2019)
Andrew Kerwin, MD (2020)
Erik Barquist, MD (2020)
Kathryn Bass, MD (2020)
Randall Burd, MD, PhD (2020)
Scott Thomas, MD (2020)

PREVENTION COMMITTEE

Zara Cooper, MD, MSc Chair (2018)
Keith Clancy, MD, MBA Vice-Chair (2018)
Christine Cocanour, MD (2018)
Robert Driscoll, MD (2018)
Alexander Eastman, MD, MPH (2018)
Kimberly Joseph, MD (2018)
Erik Streib, MD (2018)
Scott Thomas, MD (2018)
Michael Coburn, MD (2019)
Mayur Narayan, MD, MPH, MBA (2019)
Rochelle Dicker, MD (2019)
Michael Rosenblatt, MD (2019)
Sheldon Teperman, MD (2019)
Spiros Frangos, MD (2019)
Amy Goldberg, MD (2020)
Carnell Cooper, MD (2020)
D'Andrea Joseph, MD (2020)
Deborah Kuhls, MD (2020)
Heena Santry, MD (2020)
Kathryn Tchorz, MD (2020)
Omar Danner, MD (2020)
Ronald Stewart, MD (2020)

COMMUNICATIONS COMMITTEE

Jason Smith, MD, Chair (2019)
Adrian Maung, MD, Vice Chair (2020)
Chad Ball, MD (2018)
Vishal Bansal, MD (2018)
William Bromberg, MD (2018)
Janette Capella, MD (2018)
Murray Cohen, MD (2018)
Amy Goldberg, MD (2018)
Patrick Kim, MD (2018)
Eric Toschlog, MD (2018)
James Tyburski, MD (2018)
Amy Wyrzkowski, MD (2018)
Jay Yelon, MD, DO (2018)
Rachael Callcut, MD 2019)
Ben Zarzaur, Jr., MD (2019)
Jon Simmons, MD (2019)
Jose Pascual Lopez, MD (2019)
Jordan Weinberg, MD (2019)
Michael Truitt, MD (2019)
David Skarupa, MD (2020)
Elliot Haut, MD, PhD (2020)
Jamie Coleman, MD (2020)
Jasmeet Paul, MD (2020)
John Como, MD (2020)
Matthew Benns, MD (2020)
Paula Ferrada, MD (2020)
Robert Winfield, MD (2020)

RESEARCH AND EDUCATION RESTRICTED FUND COMMITTEE

Michael J. Sise, MD, Chair (2019)
Adil Haider, MD, MPH (2020)
Demetrios Demetriades, MD (2020)
Joseph Minei, MD, MBA (2020)
Oscar Guillamondegui, MD, MPH (2020)
Suresh K. Agarwal, Jr., MD (2020)

DISASTER COMMITTEE

Jay Doucet, MD, MSc Chair (2020)
David Shatz, MD, Vice Chair (2020)
Marko Bukur, MD (2018)
Eric Bradburn, MD, DO (2018)
Eric J. Kuncir, MD, MSc (2019)
Joseph Amos, MD (2019)
Adam Fox, MD, DO (2019)
A. Tyler Putnam, MD (2020)
David Blake, MD, MPH (2020)
Eileen Bulger, MD (2020)
Gerd Pust, MD (2020)
Jeannette Capella, MD (2020)
Jeffrey Upperman, MD (2020)
John Harvin, MD (2020)
Mark Gestring, MD (2020)
EAST Representatives
Kyle Remick, MD (2020)
Daniel Grabo, MD (2020)

STANDING COMMITTEES

MEMBERSHIP COMMITTEE

Martin Croce, MD, Chair (2018)
David Livingston, MD (2018)
James Davis, MD (2018)
Eileen Bulger, MD (2019)
Karen Brasel, MD, MPH (2019)
Raminder Nirula, MD, PhD (2019)
Sharon Henry, MD (2020)
Clay Cothren Burlew, MD (2020)

PROGRAM COMMITTEE

Patrick Reilly, MD, Chair (2020)
Ben Zarzaur, Jr., MD (2018)
Michael F. Rotondo, MD (2018)
Eileen Bulger, MD (2019)
Karen J. Brasel, MD, MPH (2019)
Lena M. Napolitano, MD, MPH(2019)
Martin Croce, MD (2019)
Clay Cothren Burlew, MD (2020)
Robert Winchell, MD (2020)
Rosemary Kozar, MD, PhD (2020)
Ernest Moore, MD, *Ex-Officio*
Jason Smith, MD, *Ex-Officio*
Timothy Fabian, MD, *Ex-Officio*

NOMINATING COMMITTEE

Thomas M. Scalea, MD, Chair (2018)
Grace S. Rozycki, MD, MBA (2019)
Raul Coimbra, MD, PhD (2020)
Michael F. Rotondo, MD (2021)
Martin Croce, MD (2021)

SCHOLARSHIP AND AWARDS COMMITTEE

Martin Croce, MD, Chair (2018)
David H. Livingston, MD (2018)
Ajai Malhotra, MD (2018)
James Davis, MD (2018)
Eileen Bulger, MD (2019)
Raminder Nirula, MD, PhD (2019)
Karen J. Brasel, MD, MPH (2019)
Clay Cothren Burlew, MD (2020)
Sharon Henry, MD (2020)

AD HOC COMMITTEES

REIMBURSEMENT/CODING AD HOC COMMITTEE

R. Lawrence Reed, MD, Chair (2019)
Preston Miller, MD, Vice Chair (2019)
Samir Fakhry, MD (2018)
Shahid Shafi, MD (2018)
Thomas Esposito, MD, MPH (2018)
Garth Utter, MD (2019)
Jeffrey Claridge, MD, MSc (2019)
John Armstrong, MD (2019)
Jose Diaz, MD (2019)
Michael Sutherland, MD (2019)
Ronald Gross, MD (2019)
Laura Johnson, MD (2019)
Raminder Nirula, MD, PhD (2019)
Nicholas Namias, MD, MBA (2019)
Marie L. Crandall, MD, MPH (2019)
Obeid Ilahi, MD (2019)
Raeanna Adams, MD (2019)

WTC 2018 AD HOC COMMITTEE

Raul Coimbra, MD, PhD Chair (2018)
Ajai Malhotra, MD (2018)
Ari Leppaniemi, MD, PhD (2018)
Eileen Bulger, MD (2018)
Eric Voiglio, MD, PhD (2018)
Gustavo Fraga, MD, PhD (2018)
Ian Civil, MD (2018)
Luke Leenen, MD, PhD (2018)
Marc de Moya, MD (2018)
Mayur Narayan, MD, MPH, MBA (2018)
Michael Rotondo, MD (2018)
Michel Aboutanos, MD (2018)
Ronald Maier, MD (2018)
Yasuhiro Otomo, MD (2018)

FUTURE AAST MEETINGS

78th Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery

September 18–21, 2019
Sheraton Dallas
Dallas, TX

79th Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery

September 16–19, 2020
Hilton Waikoloa Village
Waikoloa, HI

80th Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery

September 29–October 2, 2021
Hilton Atlanta
Atlanta, GA

81st Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery

September 21-24, 2022
Hyatt Centric Chicago Magnificent Mile
Chicago, IL

82nd Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery

September 20-23, 2023
Hilton Anaheim
Anaheim, CA

PAST PRESIDENTS AND MEETING SITES

2017	Baltimore, Maryland	Raul Coimbra, M.D., Ph.D
2016	Waikoloa, Hawaii	Grace S. Rozycki, M.D., M.B.A
2015	Las Vegas, Nevada	Thomas M. Scalea, M.D.
2014	Philadelphia, Pennsylvania	William G. Cioffi, M.D
2013	San Francisco, California	Robert C. Mackersie, M.D.
2012	Kauai, Hawaii	J. Wayne Meredith, M.D.
2011	Chicago, Illinois	L.D. Britt, M.D., M.P.H.
2010	Boston, Massachusetts	Andrew B. Peitzman, M.D.
2009	Pittsburgh, Pennsylvania	Gregory J. Jurkovich, M.D.
2008	Maui, Hawaii	Timothy C. Fabian, M.D.
2007	Las Vegas, Nevada	David V. Feliciano, M.D.
2006	New Orleans, Louisiana	C. William Schwab, M.D.
2005	Atlanta, Georgia	Steven R. Shackford, M.D.
2004	Maui, Hawaii	H. Gill Cryer, M.D., Ph.D.
2003	Minneapolis, Minnesota	David B. Hoyt, M.D.
2002	Orlando, Florida	Ronald V. Maier, M.D.
2001	No Meeting Due to 9/11	Ronald V. Maier, M.D.
2000	San Antonio, Texas	Frank R. Lewis, Jr., M.D.
1999	Boston, Massachusetts	J. David Richardson, M.D.
1998	Baltimore, Maryland	Anna M. Ledgerwood, M.D.
1997	Waikoloa, Hawaii	Anthony A. Meyer, M.D., Ph.D.
1996	Houston, Texas	Kenneth L. Mattox, M.D.
1995	Nova Scotia, Canada	Cleon W. Goodwin, M.D.
1994	San Diego, California	Ernest E. Moore, M.D.
1993	New Orleans, Louisiana	C. James Carrico, M.D.
1992	Louisville, Kentucky	Lewis M. Flint, M.D.
1991	Philadelphia, Pennsylvania	F. William Blaisdell, M.D.
1990	Tucson, Arizona	P. William Curreri, M.D.
1989	Chicago, Illinois	H. David Root, M.D., Ph.D.
1988	Orange County, California	Donald S. Gann, M.D.
1987	Montreal, Canada	Donald D. Trunkey, M.D.
1986	Honolulu, Hawaii	Francis C. Nance, M.D.
1985	Boston, Massachusetts	David S. Mulder, M.D.
1984	New Orleans, Louisiana	George F. Sheldon, M.D.
1983	Chicago, Illinois	Basil A. Pruitt, Jr., M.D.
1982	Colorado Springs, Colorado	Robert J. Freeark, M.D.
1981	Hot Springs, Virginia	Charles R. Baxter, M.D.
1980	Phoenix, Arizona	Leonard F. Peltier, M.D.
1979	Chicago, Illinois	Roger Sherman, M.D.
1978	Lake Tahoe, Nevada	William R. Drucker, M.D.
1977	Detroit, Michigan	Alexander J. Walt, M.D.
1976	Colorado Springs, Colorado	Joseph D. Farrington, M.D.
1975	Scottsdale, Arizona	John H. Davis, M.D.
1974	Hot Springs, Virginia	John A. Moncrief, M.D.
1973	Chicago, Illinois	Crawford Campbell, M.D.
1972	San Francisco, California	Moore Moore, Jr., M.D.
1971	New York City, New York	Curtis P. Artz, M.D.
1970	Chicago, Illinois	Sawnie R. Gaston, M.D.
1969	Portland, Oregon	John E. Raff, M.D.
1968	Montreal, Canada	Fraser N. Gurd, M.D.

1967	Chicago, Illinois	Edwin F. Cave, M.D.
1966	Santa Barbara, California	Raymond Householder, M.D.
1965	Philadelphia, Pennsylvania	William T. Fitts, Jr., M.D.
1964	Chicago, Illinois	Rudolph J. Noer, M.D.
1963	San Francisco, California	Oscar P. Hampton, Jr., M.D.
1962	Hot Springs, Virginia	Preston A. Wade, M.D.
1961	Chicago, Illinois	Harrison L. McLaughlin, M.D.
1960	Coronado, California	James K. Stack, M.D.
1959	Bretton Woods, New Hampshire	Truman G. Blocker, M.D.
1958	Chicago, Illinois	W.L. Estes, Jr., M.D.
1957	Hot Springs, Virginia	Charles G. Johnston, M.D.
1956	Santa Barbara, California	Warren H. Cole, M.D.
1955	Chicago, Illinois	Robert H. Kennedy, M.D.
1954	Atlantic City, New Jersey	Eslie Asbury, M.D.
1953	Chicago, Illinois	Martin C. Lindem, M.D.
1952	New York City, New York	Arthur R. Metz, M.D.
1951	Montreal, Canada	R. Arnold Griswold, M.D.
1950	Salt Lake City, Utah	Gordon M. Morrison, M.D.
1949	Atlantic City, New Jersey	Paul B. Magnuson, M.D.
1948	Chicago, Illinois	Casper F. Hegner, M.D.
1947	Atlantic City, New Jersey	Ralph G. Carothers, M.D.
1946	San Antonio, Texas	Grover C. Penberthy, M.D.
1945	No Meeting Due to War	Charles S. Venable, M.D.
1944	Chicago, Illinois	Charles S. Venable, M.D.
1943	No Meeting Due to War	Henry C. Marble, M.D.
1942	Boston, Massachusetts	Henry C. Marble, M.D.
1941	Montreal, Canada	Fraser B. Gurd, M.D.
1940	Atlantic City, New Jersey	Edgar L. Gilcreest, M.D.
1939	Hot Springs, Virginia	Kellogg Speed, M.D.

AAST ABSTRACT OF PAPERS

77th Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery
4th World Trauma Congress

AMA PRA Category 1 Credits™ will be awarded based upon actual hours attended. Total number of hours will be calculated from information individual physicians provide in the online CME evaluation forms.

September 26-29, 2018 • San Diego, CA

WELCOME
Wednesday, September 26, 2018
7:30 AM-8:00 AM
Location: Seaport D-H, Second Level (Seaport Tower)
PRESIDING: Michael Rotondo, MD

Session I: Plenary - Papers #1-8
Wednesday September 26, 2018
8:00 AM-10:40 AM
Location: Seaport D-H, Second Level (Seaport Tower)
Moderator: Michael Rotondo, MD
Recorder: Patrick Reilly, MD

Session I: Papers 1-8 Plenary
Paper 1: 8:00-8:20 am

ACS-COT VERIFICATION LEVEL AFFECTS TRAUMA CENTER MANAGEMENT OF PELVIC RING INJURIES AND PATIENT MORTALITY

Bryant Oliphant MBA,MD, Christopher Tignanelli MD, Lena M. Napolitano* MD, James A. Goulet MD, Mark R. Hemmila* MD, University of Michigan

Invited Discussant: Todd Costantini, MD

Introduction: Pelvic ring fractures represent a complex injury that requires specific resources and clinical expertise for optimal trauma patient management. We examined the impact of treatment variability for this type of injury at Level 1 and 2 trauma centers on patient outcomes.

Methods: Trauma quality collaborative data (2011-2017) were analyzed. This includes data from 29 ACS_COT verified Level 1 and Level 2 trauma centers. Inclusion criteria were adult patients (≥16 years), ISS ≥ 5, blunt injury, and evidence of a partially stable or unstable pelvic ring fracture which was classified via the Abbreviated Injury Scale version 2005 (AIS2005). Patients directly admitted, transferred out for definitive care, penetrating trauma or with no signs of life were excluded. Propensity score matching was used to create 1:1 matched cohorts of patients treated at Level 1 or 2 trauma centers. Trauma center verification level was the exposure variable used to compare management strategies, resource utilization, and in-hospital mortality in univariate analysis.

Results: We selected 1220 well matched patients, from 1,768 total patients, using propensity score methods (610 Level 1 and 610 Level 2 cohort). There were no significant baseline characteristic differences noted between the groups Patients with pelvic ring fractures treated at Level 2 centers had significantly increased mortality (Table). These patients were also less likely to receive interventional angiography, undergo complicated definitive orthopaedic operative treatment, and to be admitted to the ICU. Level 2 centers were more likely to admit their patients to stepdown type units. The failure to rescue rate was lower in patients in an ICU than in those in a non-ICU setting.

Conclusions: Admission with a partially-stable or unstable pelvic ring injury to a Level 2 trauma center is associated with increased mortality. Level 2 trauma centers had significantly less utilization of advanced treatment modalities. This variation in clinical practice highlights processes to emphasize in the appropriate treatment of these critically ill patients.

Outcome % (n)	Level 1 Trauma Center	Level 2 Trauma Center	p-value
Mortality	7.7 (47)	11.6 (71)	0.02
Process % (n)			
Angiography	11 (66)	6 (39)	0.009
ORIF/CRPF	42 (256)	32 (197)	0.002
ICU admission	52 (269)	45 (218)	0.02
Stepdown admission	6.8 (35)	19 (93)	<0.001
ORIF, Open Reduction Internal Fixation; CRPF, Closed Reduction Percutaneous Fixation			

NOTES

Session I: Papers 1-8 Plenary
Paper 2: 8:20-8:40 am

KETAMINE INFUSION FOR PAIN CONTROL IN ADULT PATIENTS WITH MULTIPLE RIB FRACTURES: RESULTS OF A RANDOMIZED CONTROLLED TRIAL

Thomas Carver* MD, Nathan Kugler MD, Janelle Juul PharmD, William Peppard PharmD, Lewis Somberg MD, Karin Madsen MD, Aniko Szabo Ph.D., Ziyan Yin MS, Jasmeet Paul* MD, Medical College of Wisconsin

Invited Discussant: David Spain, MD

Introduction: Rib fractures occur in up to 40% of trauma patients with pulmonary complications increasing the associated mortality. Opiate-based pain regimens remain the cornerstone of rib fracture management; however, concerns around opioids have fostered interest in alternative analgesics. Ketamine is an attractive analgesic but evidence to support the use of ketamine within the trauma population is lacking.

Methods: A prospective, randomized, double-blind placebo-controlled trial of non-elderly adult patients with at least three rib fractures admitted to a Level 1 trauma center was conducted. Patients over 64 years of age, GCS less than 13, or chronic opiate users were excluded. Patients were treated using a standardized multi-modal pain management protocol. Those randomized to the experimental arm received ketamine at a rate of 2.5 mcg/kg/min within 12-hours of arrival. The placebo cohort received an equivalent rate of normal saline and all infusions were continued for 48-hours. The primary outcome of the study was reduction in numeric pain score (NPS) in the first 24 hours after infusion initiation. Secondary outcomes include oral morphine equivalent (OME) utilization, intensive care unit and overall length of stay, epidural placement rate, pulmonary complications, and adverse events related to ketamine.

Results: Ninety-one patients were enrolled with 45 (49%) randomized to the experimental arm. Experimental and placebo groups were similar in makeup. Overall, 74.7% of patients were male, had a median age of 49 years, and an injury severity score (ISS) of 14. Motor vehicle collision was the most common (45.7%) mechanism of injury. Ketamine infusion was not associated with a significant reduction in 24-hour NPS or OME totals. Subgroup analysis of 45 severely injured patients (ISS >15) demonstrated ketamine infusion was associated with a significant reduction in OME utilization during the first 24-hours (35.7 vs. 68, p=0.03), 24-48 hours (64.2 vs 96, p=0.03), and overall (152.1 vs 198, p=0.048). There was no difference in adverse events between groups. No other secondary outcome differences were observed.

Conclusion: This is the first prospective randomized double-blind, placebo-controlled trial of ketamine in patients with rib fractures. While ketamine infusions failed to decrease NPS or OME within the overall cohort, a decrease in opioid use among severely injured patients was observed. While further studies are necessary to expand on these results, ketamine infusions appear to be a useful adjunct among severely injured trauma patients.

NOTES

Session I: Papers 1-8 Plenary
Paper 3: 8:40-9:00 am

CLEARING THE CERVICAL SPINE FOR PATIENTS WITH DISTRACTING INJURIES: AN AAST MULTI-INSTITUTIONAL TRIAL

Sean Liebscher Hannah C. Reiser MD, Michael Anstadt MD, Patrick Bosarge* MD, Jacob Quick MD, Stephen Barnes* MD, LaDonna Allen RN, Nicholas Morin MD, Mario Gomez MD, Abid Khan MD, Thomas Schroeppel* MD, Heitor Consani MD, Shannon Carroll MD, Richard P. Gonzalez* MD, Loyola University Medical Center

Invited Discussant: Kenji Inaba, MD

Introduction: Previous single institution studies have shown that clinical examination of the cervical spine (c-spine) is sensitive for clearance of the c-spine in blunt trauma patients with distracting injuries. Despite an unclear definition and a paucity of data defining distracting injury in the context of c-spine clearance, ATLS guidelines and most trauma centers adhere to the notion that distracting injuries adversely affect the sensitivity of c-spine clinical examination for identification of clinically significant injury. A prospective AAST sponsored multi-institutional trial was performed to assess the sensitivity of clinical examination screening of the c-spine in awake and alert blunt trauma patients with distracting injuries.

Methods: Seven Level 1 trauma centers participated in the study. During the 42-month period from July 2014 to December 2017, blunt trauma patients older than 18 years were prospectively evaluated with a standard cervical spine examination protocol. Awake and alert patients with a Glasgow Coma Score (GCS) $\geq$14 underwent clinical examination of the c-spine. Clinical examination was performed regardless of the presence of distracting injuries. Patients without complaints of neck pain, tenderness or pain on range of motion were considered to have a negative c-spine clinical examination. All patients with and without distracting injuries were assessed. All patients with positive or negative c-spine clinical examination underwent computerized tomographic (CT) scan of the entire c-spine. Clinical examination findings were documented prior to CT scan. Distracting injuries were classified into three anatomic regions: head injuries, torso injuries and long bone fractures.

Results: During the 42-month study period, 2929 patients were entered. 70% of the patients (2,058 patients) were diagnosed with at least one distracting injury. Two hundred and twenty-three (7.6%) patients in the study population were diagnosed with a c-spine injury. One hundred and thirty-six patients with distracting injuries were diagnosed with c-spine injury, 14 (10.3%) of which were missed by clinical examination. Eighty-seven patients without distracting injury were diagnosed with c-spine injury of which 11 (12.6%) were missed by clinical examination ($p = 0.58$). Only one injury missed by clinical examination underwent surgical intervention.

Conclusion: In the awake and alert blunt trauma patient with distracting injuries, clinical examination is a sensitive screening method for significant cervical spine injury. Distracting injuries do not appear to affect the sensitivity of c-spine clinical examination. As with patients who do not have distracting injuries, radiological assessment is unnecessary for safe clearance of the asymptomatic cervical spine in awake and alert blunt trauma patients with distracting injuries. These findings suggest potential reduction of both healthcare cost and patient radiation exposure.

NOTES

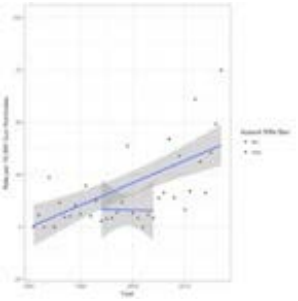
Session I: Papers 1-8 Plenary
Paper 4: 9:00-9:20 am

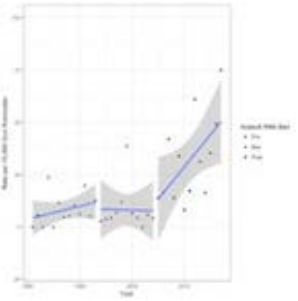
THE EFFECTIVENESS OF THE 1994-2004 FEDERAL ASSAULT WEAPONS BAN IN CONTROLLING MASS SHOOTING DEATHS: ANALYSIS OF OPEN-SOURCE DATA

Charles DiMaggio MPH,Ph.D., Cherisse Berry* MD, Marko Bukur* MD, Michael Klein* MD, Manish Tandon* MD, Spiros Frangos* MD,MPH, New York University Langone Medical Center

Invited Discussant: Ernest Moore, MD

Introduction: The Federal Assault Weapons Ban (AWB) of 1994 made the manufacture and use by civilians of a defined set of automatic and semi-automatic weapons and large capacity magazines illegal. The ban expired in 2004 and was not renewed. A federal assault weapons ban has been proposed as a way to prevent and control mass shootings in the United States; thus, the period from 1994 to 2004 serves as a natural experiment to assess the effectiveness of this policy intervention.
Methods: Mass shooting data from 1982 to 2017 were obtained from a documented, referenced, open-source set of data based on news reports. These data have been cited and used in a number of prior studies. The yearly rates of mass shooting fatalities per 10,000 gun homicide deaths in the United States were calculated. To help control for secular trends in population, we chose to normalize by gun homicides, gun ownership and violence. The period from 1994 to 2004 was compared to the non-ban periods using a linear regression model with an indicator variable for the ban period and a year variable to control for trend. The analysis was repeated for the subgroup of data restricted to incidents in which an assault-type weapon was explicitly noted.
Results: Between 1982 and 2017, 97 shooting incidents involving 4 or more victims resulted in 816 deaths among 2,091 total victim injuries, for an overall case-fatality ratio of 39.0% (95% CI 36.9, 41.1). On average, each year an additional gun-related death in the United States was due to a mass shooting (coefficient for year = 1.01, p = 0.0001), with increment in year alone capturing over a third of the overall variance in the data (Adjusted R-squared = 0.3745). This strong underlying linear trend reversed during the years in which the AWB was in effect. After the ban expired, there was a dramatic increase in the rate of mass shooting fatalities. (Figures 1 and 2) In a linear regression model controlling for yearly trend, the federal ban period was associated with a statistically significant 12 fewer mass shooting related deaths per 10,000 gun homicides (p = 0.02). The model indicated that year and the federal ban alone accounted for nearly half of all the variation in the data (Adjusted R-squared = 0.4549). A similar pattern was evident in data restricted to those incidents characterized as involving assault weapons.
Conclusion: The federal assault weapons ban of 1994 to 2014 was effective in preventing and controlling mass-shooting related homicides.





NOTES

Session I: Papers 1-8 Plenary
Paper 5: 9:20-9:40 am

NATIONWIDE ANALYSIS OF RESUSCITATIVE ENDOVASCULAR BALLOON OCCLUSION OF THE AORTA (REBOA IN CIVILIAN TRAUMA.

Bellal Joseph* MD, Muhammad Zeeshan MD, Mohammad Hamidi MD, Narong Kulvatunyou* MD, Joseph Sakran* MD, Terence O'Keeffe* MD, Peter Rhee* MD, University of Arizona - Tucson

Invited Discussant: Megan Brenner, MD, MSc

Introduction: The need for improved methods of hemorrhage control and resuscitation along with the translation of endovascular specialty skills has resulted in reappraisal of resuscitative endovascular balloon occlusion of the aorta (REBOA). The aim of our study was to evaluate the outcomes in trauma patients after REBOA placement. We hypothesized that REBOA is associated with improved survival.
Methods: We performed a 2-year (2015-2016) review of TQIP and identified trauma patients who underwent REBOA placement and matched them with a similar cohort of patients (No-REBOA). Both groups were matched in a 1:2 ratio using propensity score matching for demographics, vitals (prehospital and ED SBP, HR, GCS), mechanism of injury, ISS, h-AIS, c-AIS, Pelvic fractures (intact, incompletely disrupted and completely disrupted pelvic ring), lower extremity vascular injuries and fractures, number and grades of intra-abdominal solid organ injured (liver, splenic, kidney injuries). Outcomes were rates of complications and mortality.
Results: Of the 593818 trauma patients, 420 patients (REBOA: 140; No-REBOA: 280) were matched. Mean age was 44±20 years, ISS was 29 [18-39], 74% were males and 92% patients had blunt mechanism of injury. Overall rate of complications and mortality were 7.4% and 24.5% respectively. There was no difference in 4-hours or 24-hours blood transfusion, and hospital or ICU length of stay as shown in Table 1. Mortality rate was higher in the REBOA Group as compared to the No-REBOA group (36% vs 19%, p=0.01). Patients who underwent REBOA placement were also more likely to develop AKI (10.7% vs 3.2%, p=0.02) and more likely to undergo lower extremity amputation (4.5% vs 0.7%, p=0.04). On sub-analysis using logistic regression based on SBP, REBOA was associated with worse mortality in patients with SBP 80-110 group (OR: 4.67[1.35-15.42], p=0.03) or in the SBP<80 group (OR: 2.51[1.16-14.41], p=0.03).
Conclusion: In a matched cohort of severely injured patients REBOA placement as compared to standard therapy was associated with higher rates of complications and mortality. Further clinical trials are required to define the trauma patients that may benefit from REBOA.

Table 1. Outcomes

Variables	REBOA (n=140)	No REBOA (n=280)	*P-value*
4-Hours Transfusion			
pRBC, units, median[IQR]	6[3-8]	7 [3-9]	0.14
Platelets, units median[IQR]	4 [3-9]	4 [3-8]	0.13
Plasma, units, median[IQR]	3[2-5]	3 [2-6]	0.17
24-Hours Transfusion			
pRBC, units, median[IQR]	9 [5-20]	10 [4-21]	0.21
Platelets, units median[IQR]	7 [3-13]	8 [3-12]	0.12
Plasma, units, median[IQR]	9 [6-20]	10 [7-20]	0.11
Hospital-LOS, d, median[IQR]	10 [1-20]	10 [5-22]	0.21
ICU-LOS, d, median[IQR]	5 [2-14]	6 [3-15]	0.19
Complications, % (n)			
AKI	10.7% (15)	3.2% (9)	0.02
Amputation of lower limb	4.5% (5)	0.7% (2)	0.04
Overall mortality, % (n)	36% (50)	19% (53)	0.01
ED mortality	2.9% (4)	1.8% (5)	0.35
24-Hours mortality	26% (37)	12% (33)	0.01
After 24-Hospital mortality	7.1% (9)	5.2% (15)	0.21

pRBC = Packed Red blood cells, LOS = Length of stay, ICU = Intensive care unit, AKI = Acute kidney injury, SD = Standard deviation, IQR = Interquartile range

NOTES

Session I: Papers 1-8 Plenary
Paper 6: 9:40-10:00 am

MORTALITY OUTLIER HOSPITALS AND IMPROVING THE QUALITY OF CARE IN EMERGENCY GENERAL SURGERY

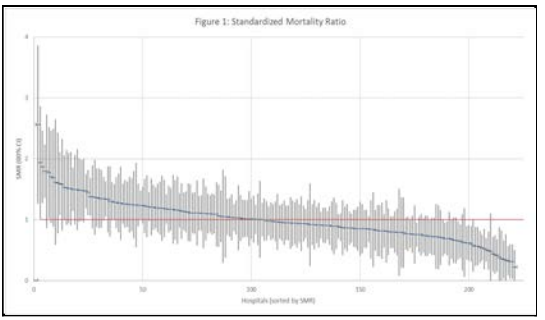
Robert D. Becher MD, MS, Michael P. DeWane MD,MPH, Nitin Sukumar MS, Marilyn J. Stolar Ph.D., Thomas M. Gill MD, Adrian A. Maung* MD, Kevin M. Schuster* MD,MPH, Kimberly A. Davis* MBA,MD, Yale School of Medicine

Invited Discussant: Shahid Shafi, MD, MPH, MBA

Introduction: Expected performance rates for various outcome metrics are a hallmark of hospital quality indicators used by AHRQ, CMS, and NQF. The identification of outlier hospitals with above- and below-expected mortality for emergency general surgery (EGS) operations is therefore of great value for EGS quality improvement initiatives. The aim of this study was to determine hospital variation in morality after EGS operations, and compare hospital-level characteristics between outlier hospitals.

Methods: Using data from the California State Inpatient Database (2010-2011), we identified patients who underwent one of eight common EGS operations. Expected mortality was obtained from a Bayesian model, adjusting for both patient- and hospital-level variables. A hospital-level standardized mortality ratio (SMR) was constructed (ratio of observed to expected in-hospital deaths). Only hospitals performing ≥3 of each operation were included. High-SMR (>1.0) and low-SMR (<1.0) "outliers" were compared; outliers had 80% confidence interval that did not cross SMR=1.0.

Results: There were 140,333 patients included from 220 hospitals. SMR (Figure 1) varied from a high of 2.56 (mortality 156% higher than expected) to a low of 0.22 (mortality 78% lower than expected). A total of 12 hospitals were high-SMR outliers, and 28 were low-SMR outliers. Patient-level characteristics (age, gender, comorbidities) were similar in both outlier groups. Standardized mortality was over 3 times worse in the high-SMR outliers compared to the low-SMR outliers (1.68 vs 0.51; p<0.001). Hospital-level characteristics were equivalent in each outlier group, including percentage of verified trauma centers, high-tech hospitals, teaching hospitals, average hospital volume, and small hospitals (<100 beds).



Conclusion: There exists significant hospital variation in standardized mortality after EGS operations. High-SMR outliers have significant excess mortality, while low-SMR outliers have superior EGS survival. Common hospital-level characteristics do not explain the wide gap between under- and over-performing outlier institutions. These findings suggest that SMR can help guide assessment of hospital EGS performance; further research is essential to identify and define the hospital processes of care which translate into optimal EGS outcomes.

NOTES

Session I: Papers 1-8 Plenary
Paper 7: 10:00-10:20 am

VARIATION IN MISSED READMISSIONS AFTER APPENDICITIS: NATIONAL ANALYSIS INCLUDING READMISSION TO A DIFFERENT HOSPITAL

Rishi Rattan MD, Joshua Parreco MD, Georgia Vasileiou MD, Daniel D. Yeh* MD, Sarah A. Eidelson MD, Joann Gold BS, Tanya L. Zakrison* MD,MPH, Nicholas Namias* MBA,MD, University of Miami

Invited Discussant: Christopher Dente, MD

Introduction: Accurate tracking of outcomes after treatment for acute appendicitis (AA) is essential. There are no national studies examining readmission after AA that include readmissions to different hospitals. The objective of this study was to determine the national rate of and risk factors for readmission after AA.

Methods: The Nationwide Readmissions Database (2010-2014) was queried for non-elective adult AA discharges. Outcomes included 30-day (d) and 1-year (yr) AA-related readmission requiring percutaneous drainage (PD) or appendectomy to index and different hospitals. Multivariate logistic regression identified risk factors.

Results: For the 1,194,014 included patients, initial management included: appendectomy (91.9%, n=1,097,835), non-operative management (NOM) (6.8%, n=81,652), and PD (1.2%, n=14,526). 30-d and 1-yr readmission for AA was 0.4% (n=4,936) and 0.7% (n=8,456) and of those, 12.6% (n=623) and 13.3% (n=1,122) were to a different hospital, respectively. Patients readmitted within 30-d and 1-yr underwent appendectomy in 34.4% (n=1,699) and 51.2% (n=4,325), and PD in 16.1% (n=795) and 11.7% (n=990) of cases, respectively. Patients readmitted to a different hospital had higher rates of appendectomy at 30-d (47.8% vs 34.4%, p<0.0001) and 1-yr (57.4% vs 51.2%, p=0.0001). 30-d and 1-yr AA-related readmission rates in the subgroup treated initially with NOM was 3.9% (n=3,173) and 6.9% (n=5,642) and of those, 14.1% (n=447) and 14.4% (n=811) were to a different hospital, respectively. Patients readmitted within 30-d and 1-yr after NOM underwent appendectomy in 38.5% (n=1,223) and 56.0% (n=3,157) and PD in 11.5% (n=336) and 8.2% (n=465) of cases, respectively. At 30-d and 1-yr, 20.6% (n=252) and 16.2% (n=513) of patients initially treated with NOM and readmitted with AA underwent an appendectomy at a different hospital, respectively. Risk factors for and protective factors against 1-yr AA-related readmission included: NOM (OR 64.73 [60.74-68.99], p<0.0001), leaving against medical advice (AMA) (OR 2.02 [1.70-2.39, p<0.0001), Medicaid (OR 1.26 [1.19-1.34], p<0.0001), diabetes (OR 1.24 [1.13-1.37], p<0.0001), and discharge to skilled nursing (OR 0.59 [0.51-0.69], p<0.0001). Risk factors for and protective factors against 1-yr AA-related readmission to a different hospital included: NOM (1.21 [1.00-1.46, p=0.052), leaving AMA (OR 4.51 [3.23-6.29], p<0.0001), drug abuse (OR 2.00 [1.34-2.99], p<0.0001), diabetes (OR 1.75 [1.06-2.89], p=0.03), for-profit hospital index admission (OR 1.56 [1.24-1.95], p<0.0001), age ≥65 years (OR 1.44 [1.10-1.88], p<0.0001), and metropolitan teaching hospital index admission (OR 0.64 [0.55-0.74], p<0.0001).

Conclusion: One in eight patients readmitted with AA and one in seven failures of NOM are missed by existing quality measures due to different hospital readmission. Current benchmarking is inaccurate and results in reporting more favorable for for-profit hospitals and less favorable for metropolitan teaching hospitals. Recurrence rates after NOM in the United States are lower than those reported in European clinical trials. Patients experiencing fragmentation of care have higher rates of operative intervention. Risk factors for readmission to a different hospital are distinct, suggesting analyses including only same hospital readmissions miss a unique subpopulation.

NOTES

Session I: Papers 1-8 Plenary
Paper 8: 10:20-10:40 am

MANAGEMENT OF ADHESIVE SMALL BOWEL OBSTRUCTION: A DISTINCT PARADIGM SHIFT IN THE UNITED STATES

Kazuhide Matsushima MD, Andrew Sabour BS, Caroline Park MD,MPH, Aaron Strumwasser MD, Kenji Inaba* MD, Demetrios Demetriades* MD,Ph.D., LAC+USC Medical Center

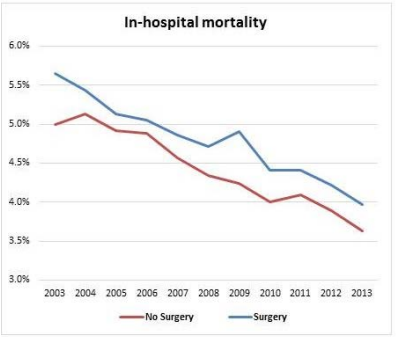
Invited Discussant: Martin Zielinski, MD

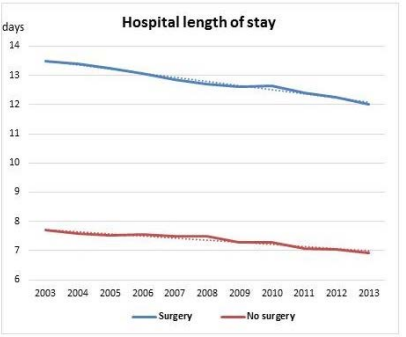
Introduction: Recent studies showed that early operative intervention in patients who fail non-operative management of adhesive small bowel obstruction (SBO) is associated with improved outcomes. The purpose of this study was to determine the trend in practice pattern and outcomes of patients with adhesive SBO in the United States.

Methods: Data from the Nationwide Inpatient Sample data (2003-2013) were extracted for analysis, and included patients (age ≥18 years) who were admitted with primary diagnosis codes consistent with adhesive SBO. We analyzed the data to examine changes in mortality and hospital length of stay (HLOS) in addition to any trends in rate and timing of operative intervention.

Results: During the study period, 1,930,289 patients were admitted with the diagnosis of adhesive SBO. While the rate of operative intervention declined (46.1 to 42.1%, p=0.0025), the timing between admission and operative intervention was significantly shortened (3.09 to 2.49 days, p<0.0001). In-hospital mortality rate decreased significantly (5.29 to 3.77%, p<0.0001). In the multiple logistic regression analysis, the relative risk of mortality decreased by 5.7% per year (OR: 0.943, 95% CI: 0.936-0.949, p<0.0001). HLOS decreased from 10.4 days to 9.06 days (P<0.0001).

Conclusion: Over the last decade, fewer patients with adhesive SBO were managed operatively, whereas those requiring an operation underwent one earlier in their hospitalization. Although further studies are warranted, our results suggest that recent changes in practice pattern may have contributed to improved outcomes.





NOTES

Session II: WTC Panel I

Hemorrhage Control for Complex Pelvic Fractures

Wednesday September 26, 2018, 10:40 AM-1:40 AM

Location: Seaport D-H, Second Level (Seaport Tower)

Moderators: Ingo Marzi, MD &

Clay Cothren Burlew, MD

Panelist:

Ingo Marzi, MD, Role of Fixation

Clay Cothren Burlew, MD, Role of Pelvic Packing Ryosuke Usui, MD, Role of Endovascular Techniques

Wednesday, September 26, 2018
11:50 AM- 12:50 PM
Session III: AAST Presidental Address
Location: Seaport D-H, Second Level (Seaport Tower)

Execute On the Vision: Pyramids and Mirages in Shifting Sands
Michael F. Rotondo, MD
Chief Executive Officer
School of Medicine and Dentistry
University of Rochester Medical Center

Presiding: Martin Croce, MD
AAST President-Elect, 2017-2018

Session V: Trauma Systems - Papers #9-16

Wednesday, September 26, 2018, 2:15 PM-4:55 PM

Location: Seaport D-H, Second Level (Seaport Tower)

Moderator: Martin Croce, MD

Recorder: Robert Winchell, MD

Session IV: Papers 9-16 Trauma Systems
Paper 9: 2:15-2:35 pm

SHOULD THEY STAY OR SHOULD THEY GO? WHO BENEFITS FROM INTERFACILITY TRANSFER TO A HIGHER LEVEL TRAUMA CENTER FOLLOWING INITIAL PRESENTATION FROM A LOWER LEVEL TRAUMA CENTER

Christopher J. Tignanelli MD, Tessa Adzemovic BS, Thomas Murray Ph.D., Julie Ottosen MD, Patei Iyegha MD, Lena M. Napolitano* MD, Mark R. Hemmila* MD, Krishnan Raghavendran* MD, Pauline K. Park* MD, Jonathan Gipson MD, University of Minnesota Dept of Surgery

Invited Discussant: Jason Sperry, MD, MPH

Introduction: The interfacility transfer of injured patients from verified or designated level 3 or 4 trauma centers to a level 1 or 2 center has been associated with improved outcomes. However, a drawback to transfer is significant rates of secondary over-triage and unnecessary resource utilization. Little data are available describing which patients derive benefit from transfer. In this study, we investigate specific injury patterns and physiologic/demographic parameters associated with improved survival following interfacility transfer to level 1 or 2 trauma centers after initial presentation at a lower level facility.
Methods: Data from the National Trauma Data Bank covering 2007 to 2014 was utilized. Inclusion criteria were adults (≥16 years). Patients with Injury Severity Score (ISS) ≤ 10, those who arrived with no signs of life, or with missing data were excluded. Patients were divided into two categories: those who were initially evaluated at and subsequently admitted to a level 3-4 trauma center verses those who were transferred from a prior hospital's Emergency Department (ED) to the ED of a level 1-2 trauma center for evaluation and treatment. Multilevel mixed effects logistic regression models were fit to the data to estimate the effect of transfer to a level 1-2 trauma center on all-cause in-hospital mortality for 16 injury patterns. Injury patterns included: any traumatic brain injury (TBI), severe (Glasgow Coma Scale (GCS) < 9) TBI, TBI with intracranial bleed, TBI with no bleed and GCS > 13, any C-spine injury, C-spine injury with spinal cord injury, all solid organ injuries, grade 3 or higher solid organ injury, bowel or pancreas injury, femur fracture, all pelvis fractures, complex pelvic fracture, any rib fracture, greater than 3 rib fractures, greater than 6 rib fractures, hemo/pneumothorax. Additional physiologic and demographic parameters were also evaluated. Each model adjusted for demographic parameters, mechanism (blunt/penetrating), injury severity parameters (ISS, TMPM-ICD-9 predicted mortality, ED vitals, GCS, assisted respirations, blood alcohol content), medical comorbidities, and hospital level random effects.
Results: 253,013 patients were included in this study. 14,405 (5.7%), were admitted to level 3-4 trauma centers and 238,608 (94.3%) were transferred into to a level 1-2 trauma center. The mean ISS was 17.8 (SD: 6.8) for patients admitted to a level 3-4 trauma center verses 20.0 (SD: 8.1) for patients transferred into a level 1-2 trauma center. Compared to the patients who were admitted to a level 3-4 trauma center, patients who were transferred to level 1-2 trauma centers had reduced mortality (OR 0.74, 95% CI 0.63 – 0.88, p < 0.001). Of the 16 injury patterns, physiologic, and demographic parameters evaluated, 3 injury patterns and 4 parameters were associated with reduced mortality, i.e. estimated OR < 1 (Table). Of the patients transferred to a level 1-2 trauma center, 56,432 (23.7%) did not have any of these 7 minimum elements. The cumulative mortality at level 1-2 centers for transferred patients without any elements was 0.5% compared with 11.2% for patients with one or more element present. Patients admitted to level 3-4 trauma centers without any elements present did not have increased mortality (0.3%).
Conclusion: Interfacility transfer of patients presenting to lower level trauma centers was associated with a survival benefit for specific cohorts of patients. Patients with TBI with intracranial bleed, GCS < 13, grade 3 or higher solid organ injury, multiple rib fractures, age ≥ 65, respiratory distress, or shock benefited from transfer. These data suggest that implementation of minimum evidence-based criteria for interfacility trauma transfer to higher level care would promote appropriate trauma triage, reduce overall resource utilization, and save lives.

Injury Pattern	**OR**	**95% CI**	**P value**
Severe TBI (GCS < 9)	0.50	0.37 - 0.68	< 0.001
TBI with any intracranial bleed	0.61	0.49 - 0.75	< 0.001
TBI with no intracranial bleed and GCS > 13	0.96	0.58 – 1.6	0.9
Grade 3+ solid organ injury	0.58	0.35 - 0.96	0.03
Greater than 6 rib fractures	0.66	0.43 - 1.0	0.056
Physiologic/Demographic Parameters			
Elderly (Age ≥ 65)	0.77	0.64 - 0.93	0.006
GCS < 13	0.53	0.42 - 0.68	< 0.001
Respiratory Distress (RR < 10, > 29)	0.69	0.47- 1.0	0.055
Shock Index > 0.8	0.64	0.49 - 0.83	0.001

NOTES

Session IV: Papers 9-16 Trauma Systems
Paper 10: 2:35-2:55 pm

DEVELOPMENT OF A GIS-BASED APPROACH FOR THE QUANTITATIVE ANALYSIS OF TRAUMA CENTER ACCESS

Paige Xu BS, Lauren E. Mount MD, Reed Huegerich MCRP, AICP, Robert J. Winchell* MD, Weill Cornell Medicine

Invited Discussant: Frederick Rogers, MD

Introduction: Decisions around trauma center (TC) designation have become contentious in many parts of the country. The problem is compounded by the fact that there is no consensus as to the ideal number and geographic distribution of TC in a region, and no reliable, objective metrics to assess the effect of changes in structure on system capacity, access, and impact on existing TC. We aim to develop a set of quantitative metrics for population access within a regional network, using publicly available data and geographic information systems (GIS)-based methodology. We hypothesize that geospatial analysis can provide a reproducible approach to transparently and quantitatively assess potential changes in trauma system structure.

Methods: Based on data availability and relative isolation, the area near Rochester, NY, was chosen for initial model development. Network analyst tools in ArcGIS Desktop 10.4 were used for geospatial calculations. Population coverage was estimated using US census tracts, with tract population located at the geographic centroid. Drive time polygons were created in 10-minute increments around target TC, and the population covered was estimated by summing the census tract centroids within the drive time area. Transport time was estimated by calculating drive time from each census tract centroid to the nearest TC. The existing TC model includes the single designated TC in the region. Model 1, with 1 additional TC, and model 2, with 2 additional TC, were created by selecting additional candidate centers from existing acute care facilities in the region in order to maximize population covered within 60 minutes of travel, and population covered in 10-minute travel increments to a TC. The population covered, distribution of estimated transport times, and estimated population covered by a specific TC were also calculated for each model.

Results: The single TC model (Fig 1) covered an estimated population of 1,093,186. The predicted median transportation time was 26.2 minutes. In model 1, with a second TC placed to optimize coverage, the population served with both centers increased by 7.7%, while the population served by the existing TC decreased by 8.5%. Median transportation time to the nearest TC was 21.1 minutes. Model 2 (Fig 2), with 3 TC, increased population covered by 10.7%, while that covered by the existing TC decreased by 18.1%. Median transportation time to the nearest TC decreased to 18.5 minutes.

Conclusion: Geo-spatial analysis can provide objective measures of population access to trauma care, including the estimated population within 60 minutes of a TC, the distribution of transport times to a TC, and the population covered by a specific TC. The analysis can be performed using different numbers and locations of TC, allowing direct comparison of changes in coverage and impact on existing centers. This type of data is essential to guide difficult decisions regarding trauma center designation in order to optimize access to care and allocation of resources.

Fig. 1: Single TC Model

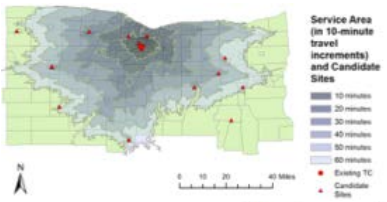
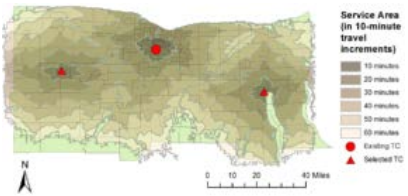


Fig. 2: Three TC Model



Time to nearest TC in minutes

	Average	1st Quartile	Median	3rd Quartile	Pop. w/in 60 min.	Projected volume of existing TC
Existing TC	26.15	8.92	15.67	38.87	1,093,186	1,093,186
Model 1	21.11	8.45	14.77	29.45	1,177,760	1,000,434
Model 2	18.48	8.22	14.57	26.36	1,210,033	895, 617

NOTES

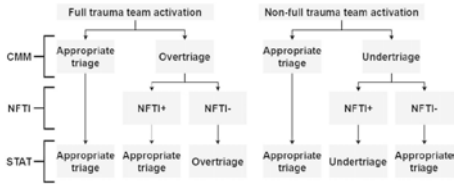
Session IV: Papers 9-16 Trauma Systems
Paper 11: 2:55-3:15 pm

AVOIDING CRIBARI GRIDLOCK 2: THE STANDARDIZED TRIAGE ASSESSMENT TOOL (STAT OUTPERFORMS THE CRIBARI MATRIX METHOD (CMM. A REPLICATION STUDY IN 35 ADULT AND PEDIATRIC TRAUMA CENTERS.

Jacob W. Roden-Foreman BA, Nakia R. Rapier RN, Michael L. Foreman* MD, Chris Cribari* MD, Megan Parsons BS, Raymond A. Coniglio MSN, Abigail R. Blackmore RN, Cassie A. Lyell RN, Stephanie D. Flohr RN, Marie Campbell RN, The Trauma Measurement Workgroup Baylor University Medical Center At Dallas

Invited Discussant: James Davis, MD

Introduction: CMM is widely used to identify over/undertriage (OT/UT) but requires case review to correct for the inadequacies of ISS. We previously developed the Need For Trauma Intervention (NFTI), which uses registry variables likely to be considered in case reviews to indicate major trauma based on resource consumption. Patients meeting any NFTI criteria are labeled NFTI+ indicating major trauma. Patients meeting no NFTI criteria are NFTI-. STAT was developed as a NFTI-adjusted version of the CMM that emulates the case review process as shown in the flowchart. This multicenter study attempted to replicate a single-center study presented at AAST in 2017 where STAT safely reclassified 52% of CMM OT/UT. We predicted lower injury burdens for OT and higher burdens for UT.



Methods: 35 adult and pediatric US trauma centers submitted data for 88,083 patients. Generalized estimating equations with robust standard errors modeled the effects of OT/UT vs. appropriate triage by triage metric on the odds of mortality and complication, as well as percent difference in total length of stay (LOS) and in number of procedures performed within three days. Total LOS and number of procedures within three days were used as surrogates for overall and early resource consumption, respectively. All models controlled for age, injury mechanism, and site-level effects.

Results: The median CMM OT rate was 53% vs. 32% with STAT. The median CMM UT rate was 22% vs. 3% with STAT. CMM and STAT OTs had significantly reduced odds of mortality and complication, shorter LOSs, and fewer early procedures, but the reductions were significantly larger with STAT. STAT UTs had significantly higher odds of mortality and complication, longer LOS, and more early procedures vs. CMM UTs. CMM UT was not associated with complication risk and was negatively associated with mortality and number of early procedures.

	CMM overtriage	p-value	STAT overtriage	p-value
Mortality, AOR (95% CI)	0.26 (0.19, 0.36)	<0.001	0.01 (0.00, 0.02)	<0.001
Complication, AOR (95% CI)	0.51 (0.41, 0.63)	<0.001	0.23 (0.16, 0.33)	<0.001
Total LOS, % difference (95% CI)	-20.84% (-29.15, -11.55)	<0.001	-44.48% (-51.71, -36.16)	<0.001
Procedures in 3 days, % difference (95% CI)	-19.07% (-25.03, -12.64)	<0.001	-29.64% (-35.54 -23.19)	<0.001

	CMM undertriage	p-value	STAT undertriage	p-value
Mortality, AOR (95% CI)	0.80 (0.67, 0.95)	0.011	23.18 (19.03, 28.22)	<0.001
Complication, AOR (95% CI)	1.01 (0.87, 1.19)	0.868	6.12 (4.57, 8.22)	<0.001
Total LOS, % difference (95% CI)	19.75% (9.59, 30.84)	<0.001	93.47% (70.01, 120.16)	<0.001
Procedures in 3 days, % difference (95% CI)	-8.98% (-14.59, -3.01)	0.004	79.88% (63.01, 98.49)	<0.001

Conclusion: While case review is the ultimate determinant, STAT safely reclassified 76% of CMM OT/UT. Though the degree of improvement varied by center, STAT was substantially more accurate than CMM. This multicenter replication confirms that STAT can flag a smaller portion of patients for more detailed review and reduce the amount of subjectivity introduced by manual triage determinations. This may allow trauma centers to better refine activation criteria and reduce workload.

NOTES

Session IV: Papers 9-16 Trauma Systems
Paper 12: 3:15-3:35 pm

Effect of Damage Control Laparotomy on Major Abdominal Complications and Lengths of Stay: a Propensity Score Matching and Bayesian Analysis

John A. Harvin* MD, John P. Sharpe MD, Martin A. Croce* MD, Michael D. Goodman MD, Timothy A. Pritts* MD,Ph.D., Elizabeth D. Dauer MD, Benjamin J. Moran MD, Rachel D. Rodriguez MD, Ben L. Zarzaur* MD,MPH, Laura A. Kreiner MD, Jeffrey A. Claridge* MD, John B. Holcomb* MD, University of Texas Medical School-Houston

Invited Discussant: Peter Rhee, MD, MPH

When creating your abstract, the only section headers to be used are listed below, and they need to be in this format (please remove this line before creating your abstract):

Introduction:
In patients for whom surgical equipoise exists for damage control laparotomy (DCL) and definitive laparotomy (DEF), the effect of DCL and its associated resource utilization are unknown. We hypothesized that DEF would be associated with fewer abdominal complications and less resource utilization.

Methods:
In 2016, 6 US Level 1 trauma centers performed a year-long, prospective, quality improvement project with the primary aim to safely decrease the use of DCL. From this prospective cohort of patients of undergoing emergent trauma laparotomy, a group who underwent DCL but were retrospectively judged by majority faculty vote to have been candidates for definitive laparotomy (potential DEF or pDEF). These pDEF patients were matched in a 1:1 ratio using propensity scoring to the DEF patients. The primary outcome was the incidence of major abdominal complications (MAC), defined as fascial dehiscence, organ/space surgical site infection, reopening of fascia, enteric suture line failure, and secondary outcomes were lengths of stay (hospital-/ICU-/ventilator-free days). Deaths within 5 days were excluded. Outcomes were assessed using Bayesian multilevel generalized linear modeling and negative binomial regression.

Results:
872 total patients were enrolled, 639 (73%) DEF and 209 (24%) DCL. Of the 209 DCLs, 44 were judged to be patients who could have safely been closed at the primary laparotomy and survived 5 days. 39 of these pDEF patients were matched to 39 DEF patients. There were no difference in: demographics; mechanism of injury; Injury Severity Score: prehospital/emergency department/operating room vital signs, labs, and resuscitation; procedures performed during laparotomy. There was no difference in MAC between the two groups (31% DEF vs 21% pDEF, relative risk 0.99, 95% credible interval 0.60 – 1.54, posterior probability 56%). DEF was associated with a 72%, 77%, and 72% probability of more hospital-, ICU-, and ventilator-free days, respectively (Table).

	DEF (n=39)	pDEF (n=39)	Incidence Rate Ratio	95% Credible Interval	Posterior Probability
Hospital-free days	15 (0, 21)	13 (0, 17)	1.30	0.60 – 2.49	72%
ICU-free days	26 (13, 29)	21 (10, 25)	1.17	0.79 – 1.68	77%
Ventilator-free days	29 (20, 30)	26 (14, 28)	1.12	0.79 – 1.53	72%

Conclusion:
In patients for whom surgeons have equipoise for damage control laparotomy versus definitive surgery, definitive abdominal closure was associated with no difference in major abdominal complications, but was associated with more hospital-, ICU-, and ventilator-free days.

NOTES

Session IV: Papers 9-16 Trauma Systems
Paper 13: 3:35-3:55 pm

TRAUMA SYSTEM RESOURCE PRESERVATION: A SIMPLE SCENE TRIAGE TOOL CAN REDUCE HELICOPTER EMERGENCY MEDICAL SERVICES (HEMS OVER-UTILIZATION IN A STATE TRAUMA SYSTEM

Pascal Udekwu* MBA,MD, Sharon Schiro Ph.D., Eric Toschlog* MD, Meagan Farrell Ph.D., Sarah McIntyre RN, BSN, James Winslow III, MD, North Carolina Trauma Registry

Invited Discussant: Mark Gestring, MD

Introduction:The intent of HEMS is to improve outcomes in time sensitive injuries. Although some studies have purported that HEMS improves survival, they are hampered by limitations in methodology, and doubts remain regarding HEMS value. Given the cost and risk associated with HEMS, the purpose of our study was to identify scene variables that mitigate inappropriate utilization.
Methods:A state trauma registry was utilized to identify patients admitted 2013-2015. Logistic regression was utilized to evaluate the influence of scene variables on mortality in ground (GEMS) and HEMS cohorts. Variables were analyzed across the GEMS/HEMS cohorts to assess impact on mortality. Time sensitive injuries (TSI) to the trauma center were defined as Emergency Department (ED) death, dispositon to Operating Room, Invasive Procedure or Intensive Care Unit.
Results: The statewide registry accrued 94,558 patients in the period 2013-2015 of whom 71,623 were transported by GEMS and 9,180 by HEMS. 60.7% of GEMS responses were from the scene as were 50.8% of HEMS responses. Percentage of HEMS scene responses increased from 7.28% to 9.29% from 1987-1993 data previously published, total scene flights increased from 192/year to 1,554/year. Age, gender, injury type, systolic blood pressure, pulse rate and Glasgow Coma Scale Score – Motor (GCS-M) were all significantly associated with mortality as continuous variables. To create a triage model differentiating normal from abnormal information; age, systolic blood pressure, respiratory rate, pulse and injury types were converted to categorical variables where age 16.0 - 69.9, blunt injury type, systolic blood pressure greater than 90, pulse 60 – 120, respiratory rate 10 – 30 and GCS-M 6 were considered normal. Logistic regression demonstrated a strong association between these variables and mortality and incorporating all variables allowed for creation of a low risk category. HEMS and GEMS patients were separated into two groups based on these characteristics and compared. Mortality rate (MR) was low and not significantly different in HEMS and GEMS low risk patients (1.5% vs 1.3%). MR was highest in the HEMS patients not selected as low risk (12.6%). 1815 or 38.9% of all HEMS patients fell into our low risk model. 1134 (62.5%) of low risk patients were perceived not to have TSI and 15.1% were discharged home. The dominant HEMS vendor reported an average revenue of $12,875.00 per patient in 2016. Estimated revenue for all low risk patients in this study was $23.4 million, for low risk patients without TSI, $14.6 million and for patients discharged home from the emergency department, $3.5 million. For comparison, ground ambulance costs were calculated at $224 - $2204 per ride for Medicare beneficiaries in 2016, using the high estimate cost for transporting all low risk patients by ground would cost $4.0 million, with a savings of $19.4 million.
Conclusion: Adult patients with normal vital signs and GCS-M 6 can be safely transported by GEMS with no increase in mortality from HEMS. Implementing a simple “no fly” decision tool could significantly reduce inappropriate HEMS utilization and reduce trauma system costs.

NOTES

Session IV: Papers 9-16 Trauma Systems
Paper 14: 3:55-4:15 pm

LONG-TERM OUTCOMES AFTER SINGLE-LOOK TRAUMA LAPAROTOMY: A LARGE POPULATION-BASED STUDY

Jason Bowie MD, Jayraan Badiee MPH, Richard Y. Calvo Ph.D., Michael J. Sise* MD, Lyndsey E. Wessels MD, William J. Butler MD, Casey E. Dunne MPH, C. Beth Sise MSN, Vishal Bansal* MD, Scripps Mercy Hospital Trauma Service

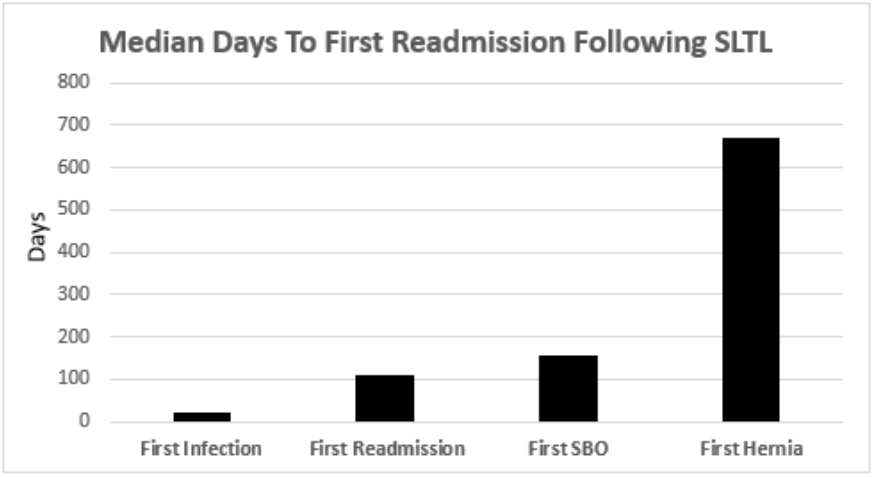
Invited Discussant: Adil Haider, MD, MPH

Introduction: Although damage control laparotomy for trauma has been studied in detail, the outcomes for patients who require only one operation, single-look trauma laparotomy (SLTL) have not been well studied. We evaluated the association between SLTL and long-term outcomes in a large, population-based dataset.

Methods: The California Office of Statewide Planning and Development patient discharge (OSHPD) database was evaluated for calendar years 2007-2014. Patients with SLTL during their index admission were identified using ICD-9-CM procedure codes. Diagnosis and procedure codes were evaluated for specific abdominal organ injuries, surgical interventions, and perioperative complications. Subsequent acute care admissions were evaluated for post-operative complications and additional related surgical interventions. Variations among clinical characteristics, injuries, surgical interventions, and outcomes were evaluated by mechanism of injury.

Results: There were 2,113 trauma patients with SLTL at their index admission; 712 (33.7%) had at least one readmission to an acute care facility with a median time to first readmission of 110 days. Penetrating mechanism was more common than blunt (61% vs. 39%). Blunt-injured patients had a significantly higher ISS compared to those patients with a penetrating injury (median 18 vs. 9, $p < 0.0001$), and significantly higher rate of mortality during their index admission (27% vs. 4%, $p < 0.0001$). Over 30% of SLTL patients requiring readmission had a surgery-related complication, with the most common primary reason for readmission being bowel obstruction (17.7%), followed by infection (9%) and incisional hernia (7%). There was no significant difference between the mechanism of injury and the development of surgery-related complications requiring readmission.

Conclusion: Patients requiring trauma laparotomy continue to have high rates of post-injury morbidity and mortality with over 10% of SLTL patients developing a surgery-related complication requiring readmission. This rate did not vary by mechanism. All SLTL patients who survive to discharge are at significant risk for subsequent complications and should be educated on the signs and symptoms of these common complications. Further investigation should focus on the factors associated with the development of these complications.



NOTES

Session IV: Papers 9-16 Trauma Systems
Paper 15: 4:15-4:35 pm

PRE-HOSPITAL TOURNIQUET USE IN PENETRATING EXTREMITY TRAUMA: DECREASED BLOOD TRANSFUSIONS AND LIMB COMPLICATIONS

Alison A. Smith MD,Ph.D., Joana Ochoa MD, Sunnie Wong BA, Sydney Beatty BS, Jeff Elder MD, Chrissy Guidry DO, Patrick McGrew MD, Juan Duchesne* MD, Rebecca Schroll MD, Tulane School of Medicine

Invited Discussant: Joseph DuBose, MD

Introduction: Despite increasing popularity of pre-hospital tourniquet use in civilians, few studies have evaluated the efficacy and safety of tourniquet use. Furthermore, previous studies in civilian populations have focused on blunt trauma patients. The objective of this study was to determine if pre-hospital tourniquet use in patients with major penetrating trauma is associated with differences in outcomes compared to a matched control group.

Methods: An eight-year retrospective analysis of adult patients with penetrating major extremity trauma amenable to tourniquet use
(major vascular trauma, traumatic amputation and near-amputation) was performed at a level I trauma center. Patients with pre-hospital tourniquet placement (TQ) were identified and compared to a matched group of patients without tourniquets (N-TQ) and similar limb injury severity. Univariate analysis was used to compare outcomes in the groups.

Results: A total of 204 patients were included with 127 (62.3%) in the TQ group. No differences in patient demographics or injury severity existed between the two groups. Average time from tourniquet application to arrival in the ED was 22.5 $\pm$1.3 minutes. Patients in the TQ group had higher average SBP on arrival in the ED (120.4$\pm$1.7 vs. 112.3 $\pm$2.1, p=0.0033). TQ group required less total PRBCs (2.0$\pm$0.1 vs. 9.3$\pm$0.6, p<0.0001) and FFP (1.4$\pm$0.08 vs. 6.2$\pm$0.4, p<0.0001). Tourniquets were not associated with nerve palsy (p=0.33) or secondary infection (p=0.43). Fasciotomy was significantly higher in the N-TQ group (12.6% vs. 31.4%, p=0.0008) as was limb amputation (0.8% vs. 9.1%, p=0.005).

Table 1. Outcomes for pre-hospital (TQ) vs. no pre-tourniquet (N-TQ) in patients with penetrating extremity trauma

Outcomes	Total n=204	TQ n=127	N-TQ n=77	p
Average injury severity score (SEM)	9.4 (0.6)	9.0 (0.5)	10.1 (0.6)	0.17
Average AIS of injured limb (SEM)	2.8 (0.2)	2.8 (0.2)	2.7 (0.2)	1.0
Average ER SBP, mmHg (SEM)	117.4 (1.9)	120.4 (1.7)	112.3 (2.1)	**0.0033**
Shock (SBP<90 mmHg) on arrival, n (%)	34 (16.7)	17 (13.4)	17 (22.1)	0.12
Mortality, n (%)	19 (9.3)	9 (7.1)	10 (13.0)	0.21
Total PRBCs, avg units (SEM)	4.4 (0.3)	2.0 (0.1)	9.3 (0.6)	**<0.0001**
Total FFP, avg units (SEM)	1.9 (0.1)	1.4 (0.08)	6.2 (0.4)	**<0.0001**
Nerve palsy, n (%)	10 (4.9)	8 (6.3)	2 (2.6)	0.33
Secondary infection, n (%)	7 (3.4)	3 (2.3)	4 (5.2)	0.43
Secondary limb loss, n (%)	8 (3.9)	1 (0.8)	7 (9.1)	**0.005**
Fasciotomy, n (%)	43 (21.1)	16 (7.8)	27 (35.0)	**0.0003**

Conclusion: This study demonstrated that pre-hospital tourniquets could be safely used to control bleeding in major extremity penetrating trauma with no increased risk of major complications. Pre-hospital tourniquet use was also associated with increased SBP on arrival to the ED, decreased blood product utilization and decreased incidence of limb related complications, which may lead to improved
long-term outcomes and increased survival in trauma patients.

NOTES

Session IV: Papers 9-16 Trauma Systems
Paper 16: 4:35-4:55 pm

What is the Best Surgical Management for Duodenal Trauma? A Panamerican Trauma Society (PTS Multi-CenterTrial

Paula Ferrada* MD, Juan Duchesne* MD, Gustavo Fraga* MD, Elizabeth Benjamin* MD, Andre Campbell* MD, Aberto Garcia MD, Carlos Morales MD, Bruno Pereira MD, Marcelo Ribeiro MD, Martha Quiodettis* MD, Gregory Peck DO, Juan C. Salamea MD, Vitor Kruger MD, Rao Ivatury* MD, Thomas Scalea* MD, Virginia Commonwealth University

Invited Discussant: Gregory Jurkovich, MD

Introduction: The operative management of duodenal trauma remains controversial. We hypothesized that a simplified operative approach could be safe and effective.
Methods: We conducted an international multicenter study, involving 11 PTS centers, and retrospectively reviewed duodenal injury management from January 2007 to December of 2016. Using the Research Electronic Data Capture (REDCap) tool, data on demographics, mechanism, blood loss, operative time, and associated injuries were collected. Outcomes included post-operative intra-abdominal sepsis, leak, need for unplanned surgery, length of stay, renal failure, and mortality.
Results: We collected data in 372 patients with duodenal injuries. Penetrating trauma was the most common mechanism (blunt 21%, penetrating 79%). 253 patients (68%) had associated injuries, included colon (128), pancreas (107), stomach (90), kidney (44), IVC (34), Liver (24), spleen (23), bile ducts (20), diaphragm (14), and aorta (3). Patients were badly injured with a mean ISS of 22, mean abdominal AIS of 4, and AAST grade 3 duodenal injuries. However, primary repair alone was the most common operative strategy (80%). Overall mortality was 24%. On a univariate analysis, mortality was associated with male gender, lower admission systolic blood pressure, preop transfusion, higher blood loss, longer operative time, renal failure needing dialysis, higher ISS, and associated pancreatic injury. On logistic regression, higher ISS, associated pancreatic injury, renal failure requiring dialysis and need for pre-op transfusion remained significant predictors of mortality. There was no statistical difference regarding ISS, operative time, pre-op transfusion requirement and mortality between various surgical techniques. Sepsis, leaks, and need for unplanned surgeries were statistically lower in patients that had 1 primary repair.(Table 1)
Conclusions: Need for pre-op transfusion, associated pancreatic injuries and renal failure predict mortality after duodenal injury. Primary repair alone is common and safe, even for complex injuries ß (Table abbreviations: PADT=repair with antegrade duodenal tube, or with a duodenostomy tube, with or without jenunostomy, PEwGJ =pyloric exclusion with gastrojejunostomy, PE without GE = Pyloric exclusion without gastrojejunostomy)

Type of Repair	PADT (n=37)	PE w GJ (n=16)	PE wo GJ (n=13)	Other Repair (n=7)	Primary (n=299)	p value
Mortality (Yes)	7 (18.9%)	2 (12.5%)	5 (38.5%)	2 (28.6%)	73 (24.4%)	0.5023
Transfusion before OR	20 (57.1%)	3 (25%)	7 (53.9%)	2 (28.6%)	142 (47.7%)	0.3044
Unplanned Surgeries	17 (46%)	11 (68.8%)	4 (30.8%)	4 (57.1%)	82 (27.2%)	0.0009
Renal Failure	3 (8.1%)	0	2 (15.4%)	0	19 (6.3%)	0.4586
Ventilator > 3 days	13 (35.1%)	10 (62.5%)	5 (38.5%)	5 (71.4%)	55 (18.3%)	<0.0001
Repair Leak	3 (42.9%)	7 (43.8%)	7 (53.9%)	3 (42.9%)	32 (10.6%)	<0.0001
Sepsis	14 (37.8%)	9 (56.3%)	5 (38.5%)	3 (42.9%)	47 (15.6%)	<0.0001
ISS median	25 (16 - 27)	17 (15 - 34)	21 (16 - 26)	18 (16 - 34)	22 (16 - 27)	0.9005
Age	24 (19 - 37)	24.5 (21.5 - 33.5)	22 (21 - 37)	26 (18 - 27)	29 (21 - 40)	0.4722
AAST	3(2 - 3)	3 (3 - 3)	3 (3 - 3)	5 (4 - 5)[1]	3 (3 - 3)	0.0002
Hospital LOS	19 (9 - 28)	19 (10.5 - 55)	10 (3 - 17)	31 (19 - 56)	11 (6 - 22)	0.0137
ICU LOS	4 (2 - 11)	6 (5 - 26)	4 (2 - 14)	27 (7 - 33)	2 (0 - 8)[2]	<0.0001

NOTES

Session VI: WTC Panel II

Traumatic Coagulopathy: Is It All the Same?

Wednesday, September 26, 2018, 5:00 PM-6:00 PM

Location: Seaport D-H, Second Level (Searport Tower)

Moderators: Yasuhiro Otomo, MD, PhD &

Mitchell Cohen, MD

Panelists:

Radko Komadina, MD, European Bleeding Guidelines

DIC or Trauma-Induced Coagulopathy

Bryan Cotton, MD, Western Perspective

Yasuhiro Otomo, MD, PhD, Eastern Perspective

Session VII: AAST/WTC Posters / Exhibit Hall Opening
Wednesday, September 26, 2018, 6:00 PM-7:30 PM

Location: Harbor D-I, Second Level, (Harbor Tower)

Session I — Poster #1-10
Trauma Systems
Brian Eastridge, MD and Joseph Rappold MD

Session II — Poster #11-20
Neurotrauma
Jose Pascual, MD and William Chiu, MD

Session III — Poster #21-30
REBOA
Erik Barquist, MD and Joseph DuBose, MD

Session IV — Poster #31-40
Pediatric Trauma
Richard Falcone, MD and David Nortrica, MD

Session V — Poster #41-50
Imaging
Stephen Barnes, MD and Jay Doucet, MD, MSc

Session VI — Poster #51-60
Critical Care
Pauline Park, MD and Christopher Michetti, MD

Session VII — Poster #61-70
Military
Joseph Galante, MD and Jennifer Gurney, MD

Session VIII — Poster #71-80
Coagulation
Grant Bochicchio, MD and Jay Johannigman, MD

Session IX — Poster #81-90
Geriatric
Anne Mosenthal, MD and Jay Yelon, DO

Session X — Poster #91-100
Firearm/Prevention
Kimberly Joseph, MD and Keith Clancy, MD, MBA

Session XI — Poster #101-110
EGS
Marie Crandall, MD, MPH and Ajai Malhotra, MD

Session XII — Poster #111-120
Abdominal Injury
Juan Duchesne, MD and Robert Mackersie, MD

Session XIII — Poster #121-130
Outcomes
Daniel Holena, MD and Michel Aboutanos, MD

Session XIV — Poster #131-140
Torso Trauma
David Livingston, MD and David Blake, MD, MPH

WTC Session I — Poster #141-150
International Trauma Care
Peep Talving, MD and Walter Biffl, MD

WTC Session II — Poster #151-160
Challenging Cases from Around the World
Marcelo Ribeiro, MD and Mayur Narayan, MD, MPH, MBA

Session IX: Plenary Session - Papers #17-20

Thursday, September 27, 2018, 7:30 AM-8:50 AM

Location: Seaport D-H, Second Level (Seaport Tower)

Moderator: R. Lawrence Reed, MD

Recorder: Preston MIller, MD

Session VIII: Papers 17-20
Paper 17: 7:30-7:50 am

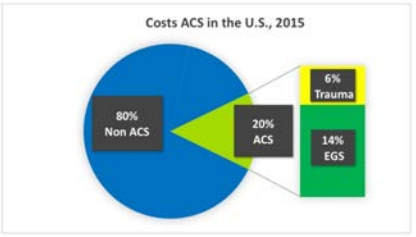
THE ECONOMIC FOOTPRINT OF ACUTE CARE SURGERY IN THE UNITED STATES: IMPLICATIONS FOR SYSTEMS DEVELOPMENT

Lisa M. Knowlton MD,MPH, Joseph Minei* MBA,MD, Andrew Bernard* MD, Kimberly A. Davis* MBA,MD, Jay Doucet* MD, Adil Haider* MD,MPH, Tres Scherer* MBA,MD, Kristan L. Staudenmayer* MD, MS AAST Healthcare Economics Committee

Invited Discussant: David Hoyt, MD

Introduction: Acute Care Surgery (ACS) comprises Trauma, Surgical Critical Care, and Emergency General Surgery (EGS), encompassing both operative and non-operative conditions. Acute care surgeons also serve as primary admitting as well as consulting physicians for ACS conditions. While the burden of EGS and trauma have been separately considered, the global footprint of ACS has not been fully characterized. Furthermore, the makeup of ACS practice has anecdotally been described as varying between institutions. We sought to characterize the scope of influence of ACS-related conditions, even when these are not the primary reasons for admission. We hypothesized that ACS patients comprise a substantial portion of the U.S. inpatient population. We further hypothesized that the ratio of trauma and EGS differs substantially across organizations, reflecting the variability among ACS practices.

Methods: We queried the National Inpatient Sample (NIS), a nationally representative database for inpatient hospitalizations. These most recent data include inpatient admissions from January to September 2015. In order to capture all adult ACS patients, we included adult admissions with any ICD-9-CM diagnosis of trauma or an ICD-9-CM diagnosis for one of the 16 AAST-defined EGS conditions. Weighted patient data are presented to provide national estimates.



Results: Of the 29.7 million adult patients admitted to U.S. hospitals, approximately 4.7 million (14%) patients had an ACS diagnosis over the 9-month study period. ACS patients accounted for $70.3 billion dollars, or 20% of total U.S. inpatient costs ($357 billion). EGS comprised the greatest proportion of the ACS population (3.4 million, or 72%). When comparing ACS to non-ACS inpatient populations, ACS patients had higher rates of healthcare utilization with longer lengths of stay (6.0 vs. 4.5 days, $p<0.001$), and higher mean costs ($15,057 vs. $11,464, $p<0.001$. Of all inpatients undergoing an operative procedure, 27% were patients with an ACS diagnosis. We next determined the mix of ACS patients at hospitals. Overall, 3,153 (70%) of U.S. hospitals cared for both trauma and EGS patients. The median percent of ACS to all patients in these centers was 16% (IQR: 13%-18%). The percent of all ACS patients who were trauma patients was similarly variable, with a median of 28% (IQR: 21%-33%).

Conclusion: Acute care surgery patients comprise 14% of the inpatient population, but 20% of total inpatient costs in the U.S. Furthermore, almost 1/3 of all inpatient operations were for an ACS diagnosis. These findings suggest that ACS conditions have the ability to significantly impact local and national healthcare and costs. Furthermore, as EGS comprises 70%-80% of ACS activities, the greatest impact may lie in improvements in care for the EGS population.

NOTES

Session VIII: Papers 17-20
Paper 18: 7:50-8:10 am

HOW MUCH GREEN DOES IT TAKE TO BE ORANGE? DETERMINING COST ASSOCIATED WITH TRAUMA CENTER READINESS

Dennis W. Ashley* MD, Robert F. Mullins MD, Christopher J. Dente* MD, Laura E. Garlow MHA, BSN, TCRN, RN, Regina S. Medeiros DNP, RN, Elizabeth V. Atkins MSN, RN, Gina Solomon RN, CCRN, TCRN, Dena Abston Colville H. Ferdinand MD, Medical Center of Central Georgia/Mercer University School of Medicine

Invited Discussant: John Fildes, MD

Introduction: Readiness Costs are real expenses incurred by trauma centers to maintain essential infrastructure to provide emergent services on a 24/7 basis. Although the components for readiness are well described in the American College of Surgeon's *Resources for Optimal Care of the Injured Patient* (Orange Book), the cost associated with each component or regulation is not well defined nor accounted for by standard hospital accounting systems. The purpose of this study was to quantify the cost of trauma center readiness based on these criteria.

Methods: The state trauma commission in conjunction with trauma medical directors, program managers, and financial officers of each trauma center standardized definitions for each component of trauma center readiness cost and developed a survey tool for reporting them. Components of readiness were grouped into four main categories: Administrative Support, Clinical Medical Staff Support, In-House Operating Room Services, and Education/Outreach with appropriate subcategories. To verify consistent cost reporting, an independent financial auditor reviewed all data. Trauma centers noted to be outliers were further reviewed to validate significant variances. The survey was completed by all designated Level I and Level II trauma centers (n=16) statewide based on calendar year 2016 data.

Results: Average annual readiness cost is $10,078,506 for a Level I trauma center and $4,925,103 for a Level II center. The clinical medical staff was the costliest component representing 55% of costs for Level I trauma centers and 65% for Level II's. Although education/outreach is mandated, Level I and II trauma centers only spend on average approximately $100,000 annually on this category (1-2%) demonstrating a relative lack of resources in this area.

Cost Category	LI Total (N=6)	LI Average	LII Total (N=10)	LII Average	Totals (N=16)
Administrative	$21,596,097	$3,599,350	$13,922,472	$1,392,247	$35,518,570
Clinical Medical Staff	$33,203,255	$5,533,876	$31,716,530	$3,171,653	$64,919,786
In House OR	$4,980,890	$830,148	$2,521,596	$252,160	$7,502,486
Education/Outreach	$690,793	$115,132	$1,090,426	$109,043	$1,781,219
Totals	$60,471,035	$10,078,506	$49,251,024	$4,925,103	$109,722,061

Conclusion: This study defines the cost associated with each component or regulation of readiness as defined in the American College of Surgeons *Resources for Optimal Care of the Injured Patient* manual. Average readiness cost for a Level I trauma center is $10,078,506 and $4,925,103 for a Level II. The significant cost of trauma center readiness highlights the need for additional trauma center funding to meet the requirements set forth by the American College of Surgeons.

NOTES

Session VIII: Papers 17-20
Paper 19: 8:10-8:30 am

MEDICAID EXPANSION ASSOCIATED WITH INCREASED ACCESS TO POST-DISCHARGE CARE FOR TRAUMA PATIENTS

John W. Scott MD,MPH, Pooja U. Neiman MD, MPA, Tarsicio Uribe-Leitz MD,MPH, Cheryl K. Zogg MSPH, MHS, Ali Salim* MD, Adil H. Haider* MD,MPH, Center For Surgery And Public Health, Department Of Surgery, Brigham And Womens Hospital

Invited Discussant: Andrew Bernard, MD

Introduction: UUninsured trauma patients have worse outcomes and worse access to critically important post-discharge care. As a part of the Affordable Care Act (ACA), 33 states expanded Medicaid eligibility criteria in 2014, in an effort to increase access to insurance coverage. The national impact of Medicaid expansion on trauma patients is not well understood.

Methods: We used the 2011-2016 National Trauma Data Bank (NTDB) to evaluate for changes in insurance coverage among 18-64 year-old trauma patients admitted to level 1 and level 2 trauma centers. Our pre-/post- Medicaid expansion models used 2011-2013 as the pre-policy period, 2015-2016 as the post-policy period, and 2014 as a washout year. To evaluate for policy-associated changes in inpatient mortality and discharge disposition, we used a risk-adjusted before-and-after linear model, which accounted for year-to-year variation in patient demographics, injury characteristics, and facility traits.

Results: We identified 1,961,102 patients meeting inclusion criteria over the six-year study period. Prior to 2014 there were no significant year-to-year changes in rates of private insurance, Medicaid, and no insurance coverage ($p>0.05$). The table shows pre- and post-policy insurance coverage rates. Notably, rates of private insurance were unchanged. The uninsured rate, however, fell by over a quarter. This change was driven by the >50% relative increase in Medicaid coverage post-expansion. No changes in inpatient mortality were observed ($p=0.314$). However, a significant increase in the rate of discharge to a facility, an increase in discharge with home services, and a decrease in the rate of discharge to home was noted ($p<0.001$ for all).

Conclusion: Although only two-thirds of states have elected to expand Medicaid eligibility through the ACA, this policy has led to a large reduction in the uninsured rate among US trauma patients. The observed increases in insurance coverage were not associated with changes in mortality, but were associated with greater access to post-discharge care—critically important to patient recovery and wellbeing after trauma.

TABLE

	Unadjusted Analyses				Risk Adjusted Analyses[b]		
	Pre-Policy[a]	Post-Policy[a]	Unadj. Difference	p-value	Adj. Difference	Relative Change	p-value
Insurance Coverage							
Private	46.9%	46.9%	0.0%	0.75	-0.6%	-1.2%	0.30
Medicaid	13.4%	20.9%	**7.5%**	<0.001	**7.6%**	56.7%	<0.001
Uninsured	23.5%	17.5%	**-6.0%**	<0.001	**-6.1%**	-26.1%	<0.001
Clinical Endpoints							
Inpatient Mortality	2.6%	2.6%	0.0%	0.549	0.1%	2.7%	0.314
Discharge to Facility[c]	14.7%	17.3%	**2.6%**	<0.001	**3.7%**	24.9%	<0.001
Discharge to Home[c]	83.8%	80.9%	**-2.9%**	<0.001	**-4.2%**	-5.0%	<0.001
Home Services[d]	6.7%	8.6%	**1.9%**	<0.001	**2.6%**	38.8%	<0.001

Source: Authors interpretation of data from the National Trauma Data Bank, 2011-2016. Unadj, unadjusted. Adj, adjusted. Diff, difference. **a**: Pre-policy period is 2011-2013, Post-policy period is 2015-2016. **b**: Insurance coverage analyses adjusted for facility-level fixed effects. Clinical endpoints adjusted for year, age, sex, injury severity score, revised trauma score, injury mechanism, injury intent, intensive care unity stay, trauma center designation level, hospital bedsize, teaching status, US census region, and facility. **c**: Among patients surviving to discharge. **d**: Among patients discharged home.

NOTES

Session VIII: Papers 17-20
Paper 20: 8:30-8:50 am

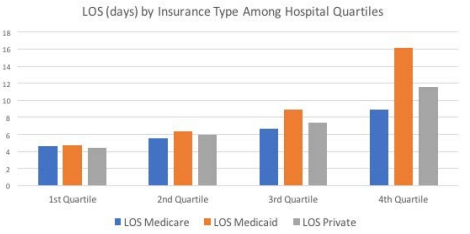
ASSOCIATION BETWEEN LENGTH OF STAY AND ACCESS TO POST-ACUTE CARE: CHALLENGES WITH DISPOSITION AND THE IMPACT ON INPATIENT COSTS

Lisa M. Knowlton MD,MPH, Mary T. Hawn MD,MPH, Lakshika Tennakoon MD, Charlotte Rajasingh David A. Spain* MD, Kristan L. Staudenmayer* MD, MS Stanford University Medical Center

Invited Discussant: Jay Doucet, MD, MSc

Introduction: Hospital costs are partly a function of length of stay (LOS), which can be impacted by the local availability of post-acute care resources, particularly for injured patients who require rehabilitation. We hypothesized that LOS for trauma patients destined for rehabilitation would be highly variable based on insurance type and hospitals from which they are discharged.

Methods: We used the 2014-2015 National Inpatient Sample, a nationally representative database for inpatient hospitalizations. We included all admissions with a primary diagnosis of trauma (ICD-9CM codes), ages of 18 to 64, insured, and whose discharge disposition was rehabilitation. We then excluded hospitals that did not treat trauma patients with all three insurance types or those who did not discharge patients to rehabilitation to ensure accurate between-group comparisons. The primary outcome was inpatient LOS; secondary outcome was cost of admission. Centers were divided into quartiles by mean LOS. Univariate and multivariate analyses were performed. Weighted patient data provide national estimates.



Results: Of the 727,900 trauma patients meeting inclusion criteria, 156,305 (22%) treated in 152 hospitals were discharged to rehabilitation and included in the analysis. Mean LOS for trauma patients discharged to rehabilitation was 5.3 days (SD 0.1), with significant variability based upon insurance type (Medicaid vs. Private vs. Medicare: 13.3 vs. 10.4 vs. 7.4 days, $p<0.001$). The mean LOS between quartiles was found to be 4.6 vs. 5.9 vs. 7.4 vs. 12.0 days ($p<0.001$). When comparing LOS by insurance type within each hospital group, there were significant differences. The top 25% of hospitals had a marginal variation in LOS based on insurance types (Medicaid vs. Private vs. Medicare: 4.7 vs. 4.4 vs. 4.6 days, $p<0.001$). In contrast, the bottom quartile had mean LOS that varied by as much as one week (16.1 vs. 11.6 vs. 8.9 days, $p<0.001$). Multivariate regression controlling for patient characteristics and injury factors revealed that Medicaid patients overall spent an additional 2.8 inpatient days compared to other insurance types (95% CI: 2.21-3.31, $p<0.001$). However, there was no difference in Medicaid patient LOS in the top 25%, when controlling for known confounders. The average daily cost of inpatient care was $3,500 (SD $132). Applying this average, Medicaid patients at hospitals without easy access to rehabilitation experience additional inpatient costs of $16,800.

Conclusion: Prolonged LOS is likely a function of access to post-acute facilities, which is largely out of the hands of trauma centers. These findings highlight that efficiencies in care are magnified by availability of post-acute beds, suggesting that increased availability of post-acute care might help to reduce length of stay.

NOTES

Session X: AAST Panel

How Should We Position Acute Care Surgery in the Landscape of Healthcare Economics

Thursday, September 27, 2018, 8:50 AM-10:00 AM

Location: Seaport D-H, Second Level (Seaport Tower)

Moderator: Joseph Minei, MD, MBA &

Kristan Staudenmayer, MD, MSc

Panelists:

Joseph Minei, MD, MBA

Kristan Staudenmayer, MD, MSc

Jay Doucet, MD, MSc

Andrew Bernard, MD

Session XI: Scholarship Presentations

By 2017-2018 AAST Research Scholarship Recipients

Thursday September 27, 2018, 10:00 AM - 10:30 AM

Location: Seaport D-H, Second Level (Seaport Tower)

Presiding: Michael Rotondo, MD, AAST President

10:00 AM-10:08 AM	Vanessa Nomellini, MD, PhD Univerisry of Cincinnati Medical Center Cincinnati, Ohio *AAST Research & Education Fund (2017-2018)* Project Title: "The Role of Sphingosine in the Susceptibility of Pneumonia in the Elderly"
10:10 AM-10:18 AM	Jonathan Wisler, MD, MS The Ohio State University Medical Center Columbus, Ohio *AAST Research & Education Fund (2017-2018)* Project Title: "Target Aberrant Epigenetic Events in the Treatment of Sepsis"
10:20 AM-10:28 AM	Samuel Pierce Mandell, MD, MPH University of Washington, Harborview Medical Center Seattle, Washington *AAST Research & Education Fund (2017-2018)* Project Title: "Optical Coherence Tomography to Predict Burn Wound Healing"

Thursday, September 27, 2018
10:45 AM-11:15 AM
Session XII: Master Surgeon Lecture I
Location: Seaport D-H, Second Level (Seaport Tower)

A Long Run for A Short Slide:
A Story of Trauma Care in New Zealand

Ian Civil, MD
Director
Trauma Services
Auckland City Hospital
Professor of Surgery
University of Auckland
Auckland, New Zealand

Session XIII: WTC Panel III

Pro/Con Debate

Thursday, September, 27, 2018

11:15 AM-12:15 PM

Location:

Moderators: Ari Leppaniemi, MD, PhD &

Zsolt Balogh, MD, PhD

Panelist:

Laparoscopy in Trauma

Selman Uranus, MD, Pro

David Feliciano, MD, Con

Grade IV Spenic Injury with Blush

Andrew Pietzman, MD, Splenectomy

Federico Coccolini, MD, Angio Embolization

Lunch - Grab & Go in Exhibit Hall

Location: Harbor D-I, Second Level (Harbor Tower)

Session XIV: WTC Power Sessions

12:30-1:30 pm

WTC PS1 How Good Can Highly Performing Trauma Systems Get?
Location: Coronado A, Fourth Level (Harbor Tower)

WTC PS2 Understanding EAST Practice Management Guidelines and Practical Tips to Adapting at your Hospital
Location: Coronado DE, Fourth Level (Harbor Tower)

WTC PS3 DCIR and REBOA
Coronado B, Fourth Level (Harbor Tower)

WTC PS4 ACS Education Program in Asia (JSACS/KSACS)
Location: Golden Hill, Third Level (Seaport Tower)

WTC PS5 Hot Topics in Trauma
Location: Harbor B, Second Level (Harbor Tower)

WTC PS6 How to Organize Trauma Care in the ICU
Location: Harbor A, Second Level (Harbor Tower)

WTC PS7 Did You Think You Had Seen It All? Unusual Cases and Discussions with Panel (You May Be On It)
Location: Harbor C, Second Level (Harbor Tower)

WTC PS8 Short Clinical Updates by the Experts: What is New and Important
Location: Seaport A-C, Second Level (Seaport Tower)

WTC PS 9 The Impact of Big Data and Artificial Intelligence on Trauma Care
Location: Hillcrest, Third Level (Seaport Tower)

Session XVA: Parallel Session - Papers #21-29

Thursday, September 27, 2018, 1:30 PM-4:30 PM

Location: Seaport D-H, Second Level (Seaport Tower)

Moderator: Deborah Kuhls, MD

Recorder: Christine Cocanour, MD

Session XVA: Papers 21-29: Parallel Session
Paper 21: 1:30-1:50 pm

PEDIATRIC FIREARM INCIDENTS: IT'S TIME TO DECREASE ON-SCENE MORTALITY

Jessica Friedman MD, Kareem Ibraheem MD, Marcus Hoof BS, Alison Smith MD,Ph.D., Riley Santiago BS, Rebecca Schroll MD, Chrissy Guidry DO, Juan Duchesne* MD, Patrick McGrew MD, Tulane University

Invited Discussant: L.R. Tres Scherer, MD

Introduction: Previous epidemiological studies on pediatric firearm mortality have focused on overall mortality rather than on-scene mortality. In spite of advances in trauma care the number of potentially preventable deaths remains high. This study utilized the National Emergency Medical Services Information Systems (NEMSIS) database to characterize patterns of on-scene mortality in order to identify patients who may benefit from changes to pre-hospital care practices.

Methods: The NEMSIS database was searched for all pediatric firearm incidents from 1/1/10 - 12/31/15. Information regarding age; gender; intention of incident; wound location, categorized as compressible for extremities and non-compressible for chest, abdomen and back; location of incident, and on-scene mortality was collected and an analysis of variance done. A linear regression model was used to calculate independent predictors of mortality.

Results: A total of 16808 patients were identified, with an on-scene mortality of 6.1%. A large percentage of mortalities suffered cardiac arrest on-scene; 72.6% of these were prior to EMS arrival, which carried a significantly higher mortality rate than cardiac arrest after EMS arrival. No difference was seen in anatomic location of injury in those who arrested before and after EMS arrival. Compressible injuries were most common at and carried the lowest mortality. Non-compressible injuries together accounted for 25.8% of injuries and 23.5% of mortalities. The mortality of self-inflicted gunshot wounds was higher than assault or accidental injury.

Conclusion: To our knowledge, this is the largest study of on-scene mortality in pediatric firearm injury to date. Cardiac arrest prior to EMS arrival was a considerable source of on-scene mortality; significantly more of these patients died than those who arrested after EMS arrival. The mortality of compressible injuries is very low, implying that use of compression and tourniquets have been effective in stopping life-threatening extremity bleeding. Based on our analysis, non-compressible injury mortality could be decreased with education of bystanders and more aggressive on-scene intervention. Consideration of modification of the current Traumatic Cardiac Arrest Treatment Algorithm with more aggressive on-scene interventions could be of benefit. Through the evaluation of on-scene mortality specifically, this study offers insight into potential areas of focus to improve pre-hospital care of pediatric gunshot victims.

Variable	Incidence (% of Total)	Deaths (% of Total)	Mortality	p value
Total	16808	1031	6.1%	<0.001
Cardiac Arrest	914 (5.5)	367 (36.4)	40.1%	<0.001
Prior to EMS	664 (72.6)	326 (88.8)	46.7%*	
After EMS	250 (27.4)	41 (12.2)	9.1%*	
Type of Firearm injuries	16808	1092		<0.001
Accidental	3617 (21.5)	101 (9.2)	2.6%*	
Assault	11215 (66.7)	447 (40.9)	3.7%*	
Self-inflicted	1976 (11.8)	544 (49.8)	36.4%*	
Anatomical Location	9698	570		<0.001
Head	2585 (26.7)	416 (73.0)	15.1%*	
Neck	276 (2.8)	13 (2.3)	4.7%*	
Chest	1025 (10.6)	112 (19.6)	8.8%*	
Abdomen	782 (8.1)	12 (2.1)	1.0%*	
Back	684 (7.1)	10 (1.8)	1.2%	
Extremity	4271 (44.0)	7 (1.2)	0.1%*	

NOTES

Session XVA: Papers 21-29: Parallel Session
Paper 22: 1:50-2:10 pm

EFFECT OF MASS SHOOTINGS ON GUN SALES – A 20 YEAR PERSPECTIVE

Rachael A. Callcut* MD, MSPH, Anamaria J. Robles MD, Lucy Z. Kornblith MD, Rebecca E. Plevin MD, Matthew W. Mell MD, M.S. University of California, San Francisco

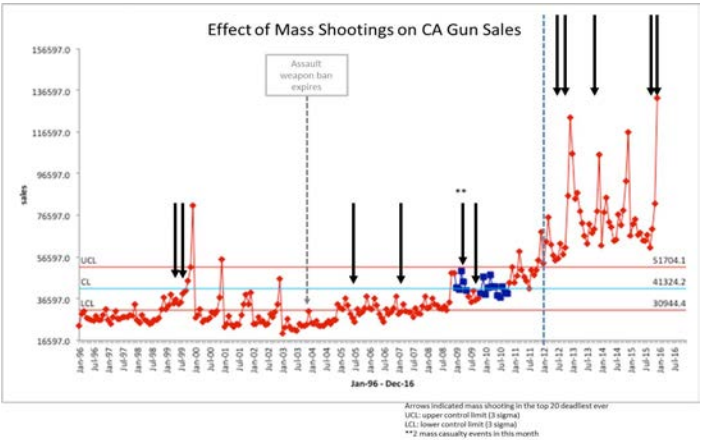
Invited Discussant: Ronald Stewart, MD

Introduction:Granular data on gun sales has been historically difficult to obtain. In 2016, California (CA) made monthly data from 1996-2015 publically available. Control charts are a well-accepted method to analyze how a process changes over time in response to non-routine events. We utilized this technique to study the impact of US mass shootings on CA gun sales.

Methods:Monthly gun sales were provided by the CA Department of Justice and monthly fatalities from the CDC Wonder Death Certificate Registry. Mass shooting events were obtained from after-action reports, news media, and court proceedings. Time ordered data were analyzed with control charts (with upper/lower control limits [UCL, LCL]) using QiMacros.

Results:9,917,811 individual gun sales occurred in CA with a median monthly rate of 41,324 (range 20,057 – 132,903). A median 263 people lost their lives monthly from firearms (124 homicide, 128 suicide), totaling 53,975 fatalities from 1999-2015. 12/20 current deadliest mass shootings occurred during this study period with 42% from 2012-15. Also, 36 school shootings occurred during the study (mean 5 deaths, range 0-33; 6 injuries, range 0-23) with 33% in 2012-15 at rate of 4 events/year vs. 1.4 events/year in the 17 prior years ($p<0.05$). Sales were generally consistent from 1996-2011 (except post Columbine [Col]). Starting in 2012 (Figure), sales exceeded the predicted UCL every single month. Before 2012, there was no statistically significant effect of mass shootings on sales (except briefly following Col); however, since Sandy Hook (SH; 2012), a statistically significant proportional spike in sales occurred in the months immediately following every single deadliest mass-shooting event. Every year since SH, CA has strengthened gun laws in response to mass shootings yet sales have risen immediately preceding enforcement of these laws each January.

Conclusion:Gun sales are more frequent since 2012, with additional spikes following both mass shootings and legislative changes enacted in response to these shootings.



NOTES

Session XVA: Papers 21-29: Parallel Session
Paper 23: 2:10-2:30 pm

INCREASINGLY PERMISSIVE FIREARM CARRY LEGISLATION IS ASSOCIATED WITH INCREASED FIREARM-RELATED SUICIDE RATES

Matthew C. Hernandez MD, Mark E. Hamill* MD, Kent Bailey Ph.D., Martin D. Zielinski* MD, Henry J. Schiller* MD, Mayo Clinic - Rochester

Invited Discussant: Zara Cooper, MD, MSc

Introduction: Public opinion about where legal gun owners may carry firearms is rapidly changing. State legislation for firearm concealed carry applications and permits (no issue, may issue, shall issue and unrestricted) have been associated with mixed results and inconclusive findings. We aimed to determine whether incremental liberalization of the concealed carry state legislation was associated with firearm related suicides.

Methods: The US Department of Justice Uniform Crime Reporting program (UCR) and Centers for Disease Control (CDC) and Prevention Web-based Injury Statistics Qurery and Reporting System databases were combined into a dataset for 51 states (including D. C.) between 1986 and 2015. Data was collected on rates of all suicide, firearm-related suicide, unemployment, and poverty by state and year throughout this time period. State level data on concealed carry legislation was recorded for every study year, broken down into four broad categories – no carry, may issue, shall issue and no restrictions. Data were analyzed using general multiple linear regression models with Y being the log of the event rate, and main effects for each unique state and year. Legislative status was analyzed both as a scale (no issue, may issue, shall issue and unrestricted), and as a binary variable non-restrictive (shall issue or no restrictions) versus restrictive (may issue or no carry). To allow for non-independence among the serial observations within a state, an autocorrelation structure was implemented in PROC GENMOD using generalized estimating equations (GEE) estimates for standard errors. The standard errors thus obtained were approximately twice as large as those assuming independence.

Results: During the study period, there was liberalization of concealed-carry legislation and is demonstrated by the distributions in Table 1 which also summarizes the temporal changes in the means of the two suicide rates. The mean (±SD) all suicide rate was 13.9 (±3.6) per 100,000 and firearm-related suicide rate was 7.6 (±3.1) per 100,000. The study period poverty rates in 1986 and 2015 were 13.9% (±4.4%) and 13.1% (±5.1%) respectively. The unemployment rates were 6.9% (±2.2%) and 5.1% (±1.1%) during 1986 and 2015. Table 2 shows regression results for both suicide event rates. The variables state and year accounted for 90% of the variation in log (rates). After adjusting for state, year, poverty, and unemployment rate, there was a marginally significant and a significant association of "non-restrictive" legislation on the rates of total and firearm-related suicides resulting in 3.23% +/- 1.70% (p=0.057) and 4.67% +/- 2.21% (p=0.035) increase, respectively. The effect of permission level (no issue, may issue, shall issue and unrestricted) on these two rates also demonstrated marginally significant increasing trends per level increase, 2.54% +/- 1.33% (p=0.057) and 3.21% +/- 1.64% (p=0.050), respectively.

Conclusions: At the macro-level, we demonstrate a relationship between expanding concealed carry firearm applications/permits with suicides committed using a firearm. The study findings were indicative of an increasing relationship with the degree of state firearm concealed-carry legislation liberalization (no carry, may issue, shall issue, and unrestricted). In order to mitigate potential loss of life, suicide prevention efforts might benefit from identifying potential gun owners with known at-risk features.

Table 1

Legislative status and suicide rates in 51 states by year						
Year	No Carry	May Issue	Shall Issue	No Restrictions	All suicide	Firearm Suicide
1986	16	26	8	1	13.7	8.4
1990	14	21	15	1	13.2	8.3
1995	9	14	27	1	12.8	7.9
2000	8	12	30	1	11.6	6.9
2005	3	9	37	2	12.4	6.8
2010	3	9	36	3	14.1	7.5
2015	0	9	35	7	15.8	8.2
Suicide rates are per 100,000 population						

Table 2

Regression Analyses of Gun Legislative Status and Rates of Suicide and Firearm -related suicide				
X-Variable	Log(Suicide rate)		Log(firearm-related suicide rate)	
Poverty Rate (%)	-0.0007 (0.0015)	-0.0008 (0.0015)	-0.0019 (0.0018)	-0.0022 (0.0018)
Unemployment Rate (%)	-0.0068 (0.0048)	-0.0061 (0.0047)	-0.0163 (0.0059)*	-0.0155 (0.0059)*
Restrictive versus Unrestricted legislation	0.0323 (0.0170)		0.0467 (0.0021)*	
Permission level status (no, may, shall, unrestricted)		0.0254 (0.0133)		0.0321 (0.0164)*

NOTES

Session XVA: Papers 21-29: Parallel Session
Paper 24: 2:30-2:50 pm

COMPARISON OF MALE AND FEMALE VICTIMS OF INTIMATE PARTNER HOMICIDE IN OPPOSITE SEX RELATIONSHIPS - AN ANALYSIS OF THE NATIONAL VIOLENT DEATH REPORTING SYSTEM

Catherine G. Velopulos MD, MHS, Heather Carmichael MD, Tanya L. Zakrison* MD,MPH, Marie Crandall* MD,MPH, University Of Colorado

Invited Discussant: D'Andrea Joseph, MD

Introduction: Intimate partner violence (IPV) is a growing public health issue, affecting at least 1 in 4 women and 1 in 9 men. Because of their greater numbers, most of the literature focuses on female victims; however, men are at significant risk. A recent multi-center trial on universal screening for IPV in trauma patients showed similar rates of positive screen between men and women. Few studies have explored the bidirectional violence in opposite sex relationships, with this dynamic likely underappreciated. Our goal was to estimate prevalence of and risk factors for the most severe manifestation of IPV, intimate partner homicide (IPH).

Methods: This is a retrospective review of the National Violent Death Reporting System (NVDRS) from 2003-2015, a CDC database comprised of surveillance data from 40 states, the District of Columbia, and Puerto Rico. Deaths were coded as IPV if the primary relationship between the suspect and victim fell into the following categories: spouse, ex-spouse, girlfriend/boyfriend, and ex-girlfriend/ex-boyfriend, collapsed here into "current partner" or "ex-partner." Cases were selected where the victim and suspect were of the opposite sex.

Results: While women were far more likely than men to be the victims in these pairings (79.3%), men constituted a significant proportion at 20.7%. Although current partners were more likely to perpetrate in either situation, male victims were significantly less likely to be murdered by an ex-partner. Black men were the only group to constitute a larger proportion of male victims, with 45.4% of male victims compared to 28.4% of female victims ($p<0.001$). Women were more likely than men to use a stabbing instrument, although firearms were still the most common means for each group. Alcohol was present in a higher proportion of male victims, and a preceding argument was more common. Male victims were also more likely to have been killed in self-defense as determined by detective reports, to have been a perpetrator of violence in the past month, and to survive long enough to be taken to a hospital. Male perpetrators frequently had a history of abusing the victim prior to the homicide (22.1%), and they attempted suicide at the time of the homicide in nearly half of the cases (46.5%), being successful in over one third (35%). There was no difference in mental illness diagnosis between men and women, with a low reported rate at around 7%.

	Female Victim	Male Victim	P value
n = 6131 (%) Opposite Sex Pairings	4861 (79.3)	1270 (20.7)	
Suspect relationship to victim (%)			<0.001
Current partner	3920 (80.6)	1116 (87.9)	
Ex-partner	*729 (15.0)*	*101 (8.0)*	
Unspecified current vs. ex	212 (4.4)	53 (4.2)	
Race/Ethnicity (%)			<0.001
Non-Hispanic White	2685 (55.2)	548 (43.1)	
Black	*1380 (28.4)*	*576 (45.4)*	
Hispanic	464 (9.5)	73 (5.7)	
Other	332 (6.8)	73 (5.7)	
Weapon/Means (%) – Top 3			<0.001
Firearm	2845 (58.5)	607 (47.8)	
Sharp	*896 (18.4)*	*538 (42.4)*	
Strangled/drowned	478 (9.8)	15 (1.2)	
Alcohol Result (%) – If Known			<0.001
Present	*1008 (20.7)*	*525 (41.3)*	
Not present	2533 (52.1)	428 (33.7)	
Preceding Argument (%)	*1502 (30.9)*	*539 (42.4)*	<0.001
Suspect w/Evidence of Justifiable Self Defense (%)	*4 (0.1)*	*81 (6.4)*	<0.001
Suspect Attempted Suicide (%)	*1601 (46.5)*	*84 (11.5)*	<0.001
Jealousy was a motive (%)	510 (10.5)	81 (6.4)	<0.001
Suspect had history of mental illness (%)	*138 (7.5)*	*39 (7.8)*	0.908
Victim was Perpetrator of Violence in Preceding Month (%)	37 (0.8)	63 (5.0)	<0.001
Victim Used Weapon Also (%)	61 (1.3)	79 (6.2)	<0.001
Victim of Violence in Preceding Month (%)	331 (6.8)	30 (2.4)	<0.001
Victim w/Evidence of History of Abuse from Suspect (%)	*843 (22.1)*	*104 (10.4)*	<0.001
Victim was treated in the ED (%)	*476 (9.8)*	*273 (21.5)*	<0.001

Conclusion: Although affected at different rates, homicide due to IPV is a significant public health crisis for both men and women, with women and Black men at particular risk. Firearms are the most commonly used weapon for homicide in both genders, and mental illness is not a common risk factor. A staggering proportion of these homicides involve suicide of the perpetrator, suggesting that each potential incident has two victims to target for prevention and intervention. Interventional programs to prevent such bidirectional mortality are urgently needed.

NOTES

Session XVA: Papers 21-29: Parallel Session
Paper 25: 2:50-3:10 pm

ESSENTIAL VIOLENCE INTERVENTION RESOURCES: AN UPDATE USING THE NATIONAL NETWORK OF HOSPITAL-BASED VIOLENCE INTERVENTION PROGRAM'S MULTI-INSTITUTIONAL DATABASE

Catherine J. Juillard* MD,MPH, Adaobi Nwabuo MPH, Kim Gajewski BS, Theodore Corbin MD, Jessika Brock BS, Rachel Myers BS, Joel Fein MD,MPH, Anne Marks MPH, Marlene Melzer-Lange MD, Thea James MD, Ariana Perry Ph.D., Rochelle A. Dicker* MD, University of California, Los Angeles

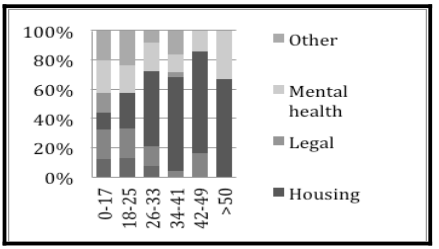
Invited Discussant: Amy Goldberg, MD

Introduction: Violence is a public health issue. Hospital-based violence intervention programs (HVIPs) have been shown to reduce violent re-injury in single institutional studies through mentorship and mitigating risks associated with violent injury. The ACS Committee on Trauma has interest in research into best practices to build HVIPs. The purpose of this study is to identify the most commonly accessed risk reduction resources in HVIPs by examining our multi-center database. We examine success rates in addressing needs.

Methods: The National Network of Hospital-Based Violence Intervention Programs database contains demographic, injury and resource utilization information about clients enrolled in five HVIPs from 2014 to 2017. Resource utilization patterns for HVIP services (education, employment, housing, legal services, mental health, and "other")were determined based on groups of interest (client age, gender, race and ethnicity). Analysis was done using frequency tables to determine proportions of services identified across the various groups of interest. Chi-squared and Fisher's exact tests were used to probe for dependence among the groups of interest.

Results: Of the 1647 clients enrolled, the majority were male (80%) and African American (AA)(86%); the median age of enrolled clients was 23 years. Overall, the most common needs identified were mental health (21%) and housing (20%). AA had a higher rate of identifying mental health and employment as a need compared to other ethnicities(p=0.00). White clients identified housing more frequently(p=0.00). Success in meeting employment needs was greatest in the AA population(p=0.00) whereas meeting the housing need was most successful in the white population(p=0.00). Needs were frequently identified and met in the Latino population but not at a significantly higher rate than other groups. Need by age catagory is listed below.

Conclusion: Early HVIP outcomes include successful enrollment of the target population and capacity to identify and address risk factors associated with violent injury. Our first-ever multi-center HVIP database identifies client needs (risk reduction targets) and ability to address needs. Our results represent a national lens on detailed differences amongst our programs' client risk factors and current abilty to address them. This insight is a critical step in identifying risk reduction activity that could ultimately reduce re-injury. As we add clients and programs to this database, future work will focus on the long term outcome of recidivism. These results can help flegling HVIPs prioritize services offered to demographic groups reflected in their often resource contrained communities.



NOTES

Session XVA: Papers 21-29: Parallel Session
Paper 26: 3:10-3:30 pm

THE GATE PROGRAM: A MULTIDISCIPLINARY INTERVENTION TO REDUCE JUVENILE GUN VIOLENCE RECIDIVISM AND POTENTIAL MODEL FOR NATIONWIDE EXPANSION

Hahn Soe-Lin MD, MS, Joyce Kaufman MD, Anjali Sarver University Of Miami Miller School Of Medicine

Invited Discussant: Rochelle Dicker, MD

Introduction: Youth firearm violence has been a growing and increasingly recognized problem in the United States. Several programs across the country aimed at reducing recurrent gun violence in this vulnerable population have published recidivism rates of 40-50%. For the past 18 years, the GATE Program in Miami-Dade County has provided a unique multidisciplinary intervention encompassing 100 hours of violence education, behavioral modification, and social mentoring. The present study defines its outcomes as a national model for youth firearm recidivism prevention.

Methods: Retrospective analysis of the Florida Juvenile Justice Department records from 2008-2016 defined a group of youths convicted of firearm related crimes and subsequently enrolled in the GATE program. Cohorts were grouped by youth who demonstrated successful completion of the GATE program versus those who only partially completed the program. At 6 and 12 months after release, records were cross referenced with the Florida Department of Justice criminal record system to prospectively capture rates of new all-comer and firearm specific criminal charges.

Results: 215 youth were included in the prospectively followed cohort at 6 months and 163 youth followed at 12 months after release. The 6-month recidivism rate for any criminal charge was 20.1% for program completers versus 32.9% for those who did not complete the program ($p=0.047$). When excluding unarmed criminal offenses, the recidivism rate dropped to 10.1% versus 22.4% respectively ($p=0.008$). At 12 months, all-comers recidivism was 33.6% for the GATE program completion cohort vs 50% for the incomplete cohort ($p=0.045$). When excluding unarmed offences, the recidivism rates were 18.6% vs 33.9% respectively ($p=0.035$).

Conclusion: The GATE program has one of the lowest recidivism rates in the country both for firearm and non-firearm related criminal offenses. Its demonstrated efficacy should serve as the basis for expansion to other local and state jurisdictions with the aim of decreasing juvenile gun violence across the country.

NOTES

Session XVA: Papers 21-29: Parallel Session
Paper 27: 3:30-3:50 pm

USE OF SHOTSPOTTER™ DETECTION TECHNOLOGY DECREASES TRANSPORT TIME FOR PATIENTS SUSTAINING GUNSHOT WOUNDS

Deviney Rattigan MD, Joshua P. Hazelton* DO, Michael Dalton MD, John Gaughan Ph.D., John S. Thompson Kyle Remick* MD, John Porter* MD, Anna Goldenberg DO, Cooper University Hospital

Invited Discussant: Alexander Eastman, MD

Introduction: Shorter transport times in patients sustaining penetrating trauma have been shown to be independently associated with improved survival. Literature has also demonstrated that these patients, when transported by police vehicle vs. EMS, have decreased transport times to a trauma center. The purpose of this study was to delineate if a gunshot detection technology called ShotSpotter ™, which triangulates the location of gunshots and alerts nearby police officers to respond, expedited patient transport to definitive care by increasing the likelihood of police response and patient transport.

Methods: All fatal shooting incidents, with the victim being at least 18 years old, which occurred within the city of Camden, New Jersey from 2006-2016 were retrospectively reviewed. Demographic, geographic, transportation, and field intervention data were collected from medical and police records. We compared fatal shootings where the ShotSpotter ™ technology was activated versus fatal shootings where ShotSpotter™ was not activated. Incidents which involved children, occurred outside the city limits, or where complete data was not available were excluded from the study.

Results: There were 105 fatal shooting incidents which met all of the inclusion criteria, with 24 (23%) resulting in the activation of the ShotSpotter™ system. Victims involved in shootings where the ShotSpotter™ system was activated were more likely to arrive at the trauma center for evaluation and potential resuscitation, rather than being pronounced dead in the field (55% vs 37%;p=0.037). Furthermore, these victims were more likely to be transported by police rather than by EMS (29% vs 6%;p=0.005) and less likely to have field interventions performed (25% vs 60 %;p=0.003). There was no difference in the trauma bay resuscitation efforts or number of procedures performed (intubation, ED thoracotomy, central venous access, chest tube, resuscitative medications) between the two groups (all p>0.05). When corrected for distance from the location of incident to the trauma center, we found that transport time in ShotSpotter™ activation incidents was significantly shorter (12min vs 16min;p=0.021).

Conclusion: The use of ShotSpotter™ technology significantly decreased transport time of victims sustaining gunshot wounds, likely due to the increased police transport of these patients rather than waiting for EMS. This resulted in fewer pre-hospital procedures and fewer victims being pronounced dead at the scene. While our data only includes incidents which were fatal, future work will involve studying the use of ShotSpotter ™ technology and its potential to improve survival.

NOTES

Session XVA: Papers 21-29: Parallel Session
Paper 28: 3:50-4:10 pm

OBSERVING PNEUMOTHORACES: THE 35 MM RULE IS SAFE FOR BOTH BLUNT AND PENETRATING CHEST TRAUMA

Savo Bou Zein Eddine MD, Kelly A. Boyle MD, Christopher M. Dodgion MBA,MD, MSPH, Christopher S. Davis MD,MPH, Travis P. Webb* MD, MHPE, Jeremy S. Juern* MD, David J. Milia MD, Thomas W. Carver* MD, Marshall A. Beckman MD, Panna A. Codner* MD, Todd A. Neideen* MD, Colleen Trevino Ph.D.,RN, FNP, Marc A. De Moya* MD, Medical College of Wisconsin

Invited Discussant: Andrew Kirkpatrick, MD

Introduction: As more pneumothoraxes (PTX) are being identified on chest computed tomography (CT), the appropriate management of observation versus tube thoracostomy (TT) remains debatable. We hypothesize that PTX measuring ≤35 mm on chest CT can be safely observed in both penetrating and blunt trauma mechanisms.

Methods: A retrospective review was conducted of all patients diagnosed with PTX by chest CT between January 2011 and December 2016. Patients were excluded if they had an associated hemothorax, had immediate tube thoracostomy (TT), or if a TT was done before the initial chest CT. PTXs were quantified by measuring the radial distance between the parietal and visceral pleura/mediastinum in a line perpendicular to the chest wall on axial imaging. Based on previous work, a cut-off of 35 mm on the initial CT was used to dichotomize the groups. Failure of observation was defined as the need for a delayed TT during the first week. A univariate analysis was performed to identify predictors of failure in both groups and multivariate analysis was constructed to assess the independent impact of PTX measurement on the failure of observation while controlling for demographics and chest injuries.

Results: Of the 1767 chest trauma patients screened, 832 (47%) had PTX and of those meeting inclusion criteria, 353 (92%) were successfully observed until discharge. Of those successfully observed, 335 (95%) patients had a measurement ≤ 35 mm. The negative predictive value for 35 mm as a cutoff was 94.9% to predict successful observation. In the univariant analyses, age ($p= 0.011$), rib fractures ($p= 0.012$), and size of the pneumothorax (≤35 mm or >35 mm) ($p< 0.0001$) were associated with failed observation. In multivariate analysis, PTX measuring ≤35 mm was an independent predictor of successful observation [OR 0.153, (95% CI: 0.061, 0.384)] for both blunt and penetrating trauma.

Conclusion: A 35 mm cut-off is safe as a general guide with only 5% of stable patients failing initial observation regardless of mechanism.

NOTES

Session XVA: Papers 21-29: Parallel Session
Paper 29: 4:10-4:30 pm

TO SLEEP, PERCHANCE TO DREAM: ACUTE AND CHRONIC SLEEP DEPRIVATION IN ACUTE CARE SURGEONS

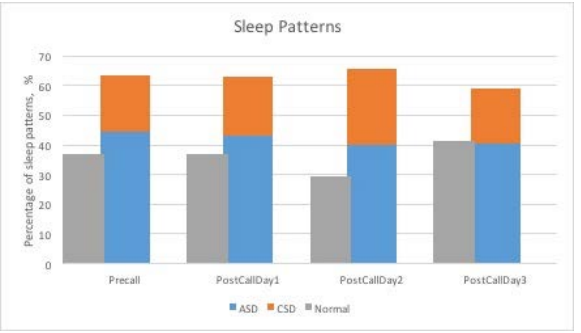
Jamie J. Coleman* MD, Ben L. Zarzaur* MD,MPH, Lava Timsina MPH,Ph.D., Grace S. Rozycki* MBA,MD, David V. Feliciano* MD, Indiana Univesity School of Medicine

Invited Discussant: Nicole Stassen, MD

Introduction: Acute and chronic sleep deprivation are significantly associated with depressive symptoms and felt to be contributors to the development of burnout. In-house call (IHC) inherently includes frequent periods of disrupted sleep and is common amongst acute care surgeons. The relationship between IHC and sleep deprivation amongst acute care surgeons has not been previously studied. The goal of this study was to determine prevalence and patterns of sleep deprivation in acute care surgeons.

Methods: A prospective study of acute care surgeons with IHC responsibilities from two ACS verified Level I trauma centers was performed. Participants wore a Whoop! fitness and sleep tracking device continuously over a 3-month period. Data collected included age, gender, schedule of IHC, hours and pattern of each sleep stage (light, slow wave, and REM), and total hours of sleep. Sleep patterns were also analyzed for each night excluding IHC and categorized as normal, acute sleep deprivation (ASD), or chronic sleep deprivation (CSD). Test of proportions for categorical and t-tests for continuous variables were done to identify any difference between pre and post-call days at 0.05 level of significance.

Results: A total of 1421 nights, including 230 nights of IHC, were recorded amongst 17 acute care surgeons (35.3% female; ages 37-65, mean of 45.5 years). Excluding nights of IHC, the average amount of sleep was 6.54 hours with 70% of nights with abnormal amounts of REM sleep, 56.4% with abnormal amounts of slow wave sleep, and 64.8% with sleep patterns categorized as ASD or CSD. The average amount of sleep was significantly higher than baseline on post-call day 1 (6.96 hours, p=0.0016), but decreased significantly on post-call day 2 (6.33 hours, p=0.0006) and returned to baseline on post-call day 3 (6.65 hours, p=0.274). Normal sleep patterns were significantly more prevalent on post-call day 3 as compared to post-call day 2 (p=0.045).



Conclusions: Sleep patterns consistent with ASD and CSD are common amongst acute care surgeons and worsen on post-call day 2. Baseline sleep patterns were not recovered until post-call day 3. Future study in a multicenter setting is needed to identify factors which impact physiologic recovery after IHC and further elucidate the relationship between sleep deprivation and burnout.

NOTES

Session XVB: Basic Science - Papers #30-38

Thursday, September 27, 2018, 1:30 PM-4:30 PM

Location: Seaport A-C, Second Level (Seaport Tower)

Moderator: Suresh Agarwal, MD

Recorder: Marc deMoya, MD

Session XVB: Papers 30-38: Basic Science
Paper 30: 1:30-1:50 pm

DOES A LUNG INFECTION AFTER BRAIN INJURY WORSEN EARLY BRAIN INFLAMMATION AND SUBSEQUENT NEUROLOGICAL RECOVERY?

Christina L. Jacovides MD, Syed M. Ahmed MD, Yujin Suto MD,Ph.D., Andrew J. Paris MD, Ryan Leone Maura T. Weber BA, Victoria E. Johnson Ph.D., MBChB, Melpo Christofidou-Solomidou Ph.D., Lewis J. Kaplan* MD, Douglas H. Smith MD, Daniel N. Holena MD, MSCE, C W. Schwab* MD, Jose L. Pascual* MD,Ph.D., University of Pennsylvania

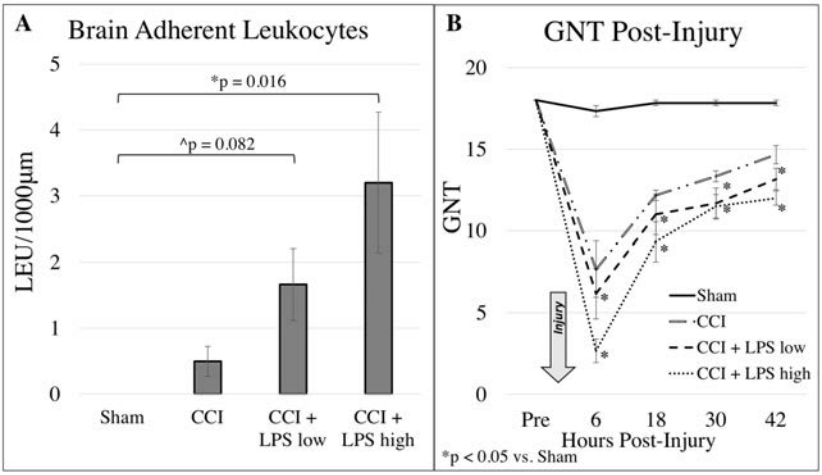
Invited Discussant: Deborah Stein, MD, MPH

Introduction: Respiratory complications after traumatic brain injury (TBI) worsen mortality and neurologic outcomes. How pulmonary infection influences active cerebral leukocyte (LEU)-mediated inflammation and resultant neurologic recovery is unknown. We hypothesized that an infection-relevant inflammatory lung insult after TBI increases penumbral LEU trafficking and worsens neurological recovery.

Methods: CD1 male mice underwent either sham craniotomy or severe TBI (controlled cortical impact – CCI: velocity=6m/sec, depth=1.0mm) ± intratracheal lipopolysaccharide (LPS – low: 0.3mg/kg in 0.02ml saline, high: 2mg/kg in 0.1ml saline). Randomization defined 4 groups (Sham, CCI, CCI+LPS low, CCI+LPS high, n=6/each). Neurological recovery (Garcia Neurological Test (GNT), max score=18) was assessed twice daily. Forty-eight hours after CCI, pial microscopy assessed *in vivo* cerebral circulating LEUs and bronchoalveolar lavage fluid was sampled for total LEU count. We used Kruskal-Wallis test with Bonferroni correction to determine intergroup differences ($p<0.05$).

Results: Animals exposed to high dose LPS following CCI demonstrated the greatest *in vivo* cerebral leukocyte adherence (Fig A) ($p=0.016$) and were significantly more neurologically impaired than sham animals at all post-injury time periods (Fig B) ($p<0.05$). While cerebral LEU rolling was similar across groups, alveolar LEU sequestration was greatest in LPS-exposed brain-injured animals ($p<0.05$).

Conclusion: An endotoxin-induced inflammatory lung insult after TBI focuses cerebral LEU trafficking to injured brain and is associated with impaired neurological recovery. LEU sequestration offers a mechanism to explain clinically relevant outcomes after TBI.



NOTES

Session XVB: Papers 30-38: Basic Science
Paper 31: 1:50-2:10 pm

ELECTROPORATION-MEDIATED LUNG GENE TRANSFER OF HUMAN FELINE SARCOMA RELATED (FER TYROSINE-KINASE MOBILIZES TOLL-LIKE RECEPTOR-4 GRANULO-MONOCYTES AND IMPROVES SURVIVAL IN MURINE MODEL OF PSEUDOMONAS AERUGINOSA PNEUMONIA

David Machado-Aranda MD, Vladislav Dolgachev Ph.D., Matthew J. Delano* MD,Ph.D., MV Suresh Ph.D., Boya Zhang BS, Samatha Swamy Sanjay Balijepalli Lynn Frydrych MD, Mark R. Hemmila* MD, Krishnan Raghavendran* MD, University of Michigan

Invited Discussant: James Hoth, MD

Introduction: Infection from *Pseudomonas aeruginosa* is a leading cause of death among trauma patients. The increasing incidence of Colistin and Carbapenem-resistant strains has been compelled the WHO to declare *Pseudomonas* a threat to global health. As an innovative strategy, restoring and stimulating our immune system by using short-term gene therapy, could be of potential therapeutic value. A recent genome-wide association study showed that *Fe*line Sarcoma *R*elated (FER) a non-receptor protein tyrosine kinase of the Fes/fps family as protective in patients (including trauma) with sepsis. In proof of concept, we have shown that non-viral electroporation-mediated (EP) delivery of FER gene, can improve survival in murine models of primary and secondary *Klebsiella* pneumonia (PNA). We asked if this same benefit could be achieved against highly virulent *Pseudomonas*.

Methods: C57/BL6 female mice received 10^8 CFU of *Pseudomonas* clinical isolate via hypo pharyngeal drop injection into lungs. At 1 h, a 100 µg dose of naked plasmid encoding the human FER gene - was given by similar technique. After waiting several breaths; 8 square wave pulses were delivered at 200 V/cm strength; 10 ms duration and 1 s apart using a BTX ECM 830 generator with electrodes under each forelimb. Survival curves were recorded. In parallel, animals were euthanized at 24 h. The trachea was cannulated and a Bronchial-alveolar lavage (BAL) was obtained. Flow cytometry, ELISA and Taqman were used to characterize BAL cells and cytokines in supernatant. Naive and infected sham-EP were used as controls. A p value of < 0.05, in Log-rank testing (for KM curves) and one-way ANOVA (for all other data) was considered significant (N=10).

Results: Clinical isolate of *Pseudomonas aeruginosa* was highly virulent, showing significant lung damage at 48 hours. Nevertheless, EP-mediated delivery of FER gene improved 5-day survival (40% vs 10%, $p < 0.05$). At 24-h post-infection, FER treatment increased total cells in BAL by 2.5 fold ($p = 0.013$). Flow cytometry and cytospin slides showed a majority of cells belonging to Granulo-monocytic lineage, with Toll-like receptor-4 (TLR-4), a major pattern recognition molecule receptor against Gram-negatives, as a predominant surface marker. Additionally electroporation of FER showed higher levels of cytokines TNFα , IL-1β , IL-6 and KC in BAL, supporting a heightened response against *Pseudomonas* infection.

Conclusion: Though showing modest results in contrast to previously reported success against *Klebsiella* infection, EP mediated gene delivery of human FER gene was able to improve survival in a primary murine model of *Pseudomonas* pneumonia. This beneficial effect appears to be mediated by robust recruitment and enhanced mobilization of TLR-4-sensitized innate inflammatory cells into alveolar spaces and therefore adapted to fight off Gram-negative infections with possible acceleration of clearance of bacteria from the lung. This provides a promising avenue of research against multidrug resistant nosocomial organisms in trauma.

NOTES

Session XVB: Papers 30-38: Basic Science
Paper 32: 2:10-2:30 pm

RED BLOOD CELL STORAGE AND ADHESION TO VASCULAR ENDOTHELIUM UNDER NORMAL OR STRESS CONDITIONS: AN IN VITRO MICROFLUIDIC STUDY

Lawrence Diebel* MD, David M. Liberati MS Wayne State University

Invited Discussant: Rosemary Kozar, MD, PhD

Introduction: Observational studies have identified an association between duration of red blood cell (RBC) storage and adverse outcomes in trauma. Hemorrhagic shock (HS) leads to impaired tissue perfusion which is associated with endothelial cell (EC) injury and glycocalyx (GC) shedding. Adhesion of stored RBC to the vacular endothelium has been shown to lead to impaired perfusion in the microcirculation and contribute to organ failure and poor outcome following HS. The role of either or both of the EC and RBC glycocalyx in this process is unknown and was studied in a *in vitro* model.

Methods: Human umbilical vein endothelial cells (HUVEC) wer plated in a microfluidic device system (MDS) under perfusion for 72 hrs. to allow EC confluence and GC maturation. RBC obtained from human volunteers (fresh) or RBC obtained from the blood bank (< 14 day storage or < 21 day storage) at 1.5% suspension were added to the perfusate at increasing flow rates. In some experiments the HS microenvironment was simulated by hypoxia-reoxygenation (HR) + epinephrine (epi) during the perfusion experiments. EC and RBC glycocalyx were measured using fluorescein labeled wheat germ agglutinin and image analysis with a fluorescent microscope. RBC adhesion to the EC in the MDS under constant flow was determined by microscopy with progressively increasing shear rate to index RBC adherence strength.

Results:

	Glycocalyx (Fluorescent intensity)	RBC Adherence	
		HUVEC control	HUVEC + HR + epi
HUVEC control (N = 5)	265.3 ± 19.6	------	------
HUVEC + HR + epi (N = 5)	143.4 ± 18.5&	------	------
Fresh RBC (N = 3)	51,038 ± 400	50 ± 11	80 ± 15
RBC < 14 day storage (N = 6)	40,939 ± 425*	103 ± 18*	189 ± 21*
RBC > 21 day storage (N = 6)	24,996 ± 650*#	175 ± 26*#	271 ± 28*#

&p< 0.05 vs. HUVEC control; *p< 0.05 vs. fresh RBC; #p< 0.05 vs. < 14 day storage

EC glycocalyx thickness was 41.2 ± 6.8 nm for the control and was reduced to 13.9 ± 5.1 nm in the HUVEC + HR + epi group ($p<0.05$). A significant fraction of the RBC adherent to the EC surface at low shear stress remained attached as the shear stress was sequentially increased to 5.0 dyne/cm2, indicating firm adherence, especially in the "old" RBC + HUVEC + HR +epi group.

Conclusion: RBC storage duration and EC exposed to "shock conditions" decrease the glycocalyx layer of each entity.. These data may help explain some of the remaining discrepancies in the clinical studies regarding the effect of RBC storage duration in the trauma population. Our data suggest that GC degradation is a component of the RBC storage lesion. Transfusion of RBC, based on the status of the RBC and EC glycocalyx may guide future strategies in trauma. Additionally the MDS platform may offer a high throughput modality to study emerging therapies for the endotheliopathy of trauma.

NOTES

Session XVB: Papers 30-38: Basic Science
Paper 33: 2:30-2:50 pm

TRANEXAMIC ACID SUPPRESSES THE RELEASE OF MITOCHONDRIAL DAMPS AND REDUCES LUNG INFLAMMATION IN A MURINE BURN MODEL

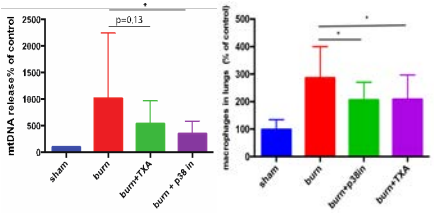
Damien W. Carter MD, Igor Prudovsky Ph.D., Doreen Kacer BS, Tee Soul BS, Monica Palmieri RN, Robert Kramer MD, Joseph Rappold* MD, Maine Medical Center

Invited Discussant: Carl Hauser, MD

Introduction: Severe burn injuries are known to initiate a profound systemic inflammatory response (SIRS) that may lead to burn shock and other SIRS related complications. Damage associated molecular patterns (DAMPs) are important early signaling molecules that initiate SIRS after burn injury. Mitochondrial DAMPs (mtDAMPs) – such as mitochondrial DNA (mtDNA) - are thought to be the most critical of these early signaling molecules. Previous work in a rodent model has shown that application of a topical immune modulator (P38 MAPK inhibitor) applied directly to the burn wound decreases cytokine expression, reduces pulmonary inflammation and edema. Our group has demonstrated that tranexamic acid (TXA) – in addition to its use as an anti-fibrinolytic – has anti-inflammatory in vitro effects. We hypothesized that administration of TXA after burn injury would attenuate mtDAMP release and reduce lung inflammation.

Methods: C57/BL6 male mice were subjected to a 40% TBSA scald burn by immersion in an 80°C water bath. Sham animals underwent the same procedure in room temperature water. All animals were resuscitated according to the Parkland formula (3cc x %TBSA x Weight [Kg]) by intraperitoneal injection (IP). One treatment group received the topical application of 1mM solution of p38 MAPK inhibitor after burn injury. The other treatment group received an IP administration of TXA (10 mg TXA per 25 g weight mouse) after burn injury. Animals were sacrificed at 4 or 8 hours. Plasma was collected by cardiac puncture. MtDNA levels in plasma were determined by qPCR. Lungs were harvested, formalin fixed and paraffin embedded. Sections of lungs were deparaffinized and stained for Mac1 antigen to detect macrophages. Numbers of macrophages per a standard square unit of lung section were calculated.

Results: Topical p38 MAPK inhibitor significantly attenuated mtDNA release while TXA trended toward a significant reduction in mtDNA release ($p \leq 0.13$). Both TXA and the topical p38 MAPK inhibitor significantly reduced lung inflammation as represented by decreased macrophage infiltration.



Conclusion:

Both p38 MAPK inhibitor and TXA demonstrated the ability to attenuate burn induced DAMP release and lung inflammation. Beyond its role as an anti-fibrinolytic, TXA may have significant anti-inflammatory effects pertinent to burn resuscitation. Further study is required; however, TXA may be a useful adjunct in burn resuscitation and other non-hemorrhagic shock states.

NOTES

ENDOTHELIAL CELL DYSFUNCTION DURING ANOXIA-REOXYGENATION IS ASSOCIATED WITH A DECREASE IN ATP LEVELS, REARRANGEMENT IN LIPID BILAYER PHOSPHATIDYLSERINE ASYMMETRY, AND AN INCREASE IN ENDOTHELIAL CELL PERMEABILITY

Javid Sadjadi* MD, Aaron M. Strumwasser MD, Gregory Victorino* MD, University of California San Francisco - East Bay

Invited Discussant: Timothy Pritts, MD

Introduction: Normanlly, phosphatidylserine (PS) is confined to the inner layer of the cell membrane (CM) and the maintenance of this PS asymmetry is an energy-dependent process. During times of stress PS is exteriorized on the CM. Because cellular stress is often accompanied by decreased energy levels and maintaining PS asymmetry is an energy-dependent process, cellular stress associated with decreased energy levels may be associated with PS exteriorization that ultimately leads to endothelial cell (EC) dysfunction and increased permeability. Anoxia-Reoxygenation (A-R) is associated with decreased adenosine triphosphate (ATP) levels, increased PS exteriorization on cells, and increased EC permeability.

Methods: : The effect on ATP levels of A-R was measured with cultured human umbilical vein endothelial cells (HUVECs). After exposure to anoxia or A-R, ATP levels were measured using a standard colorimetric assay from: 1) Controls , 2) Cells that underwent 45 minutes of anoxia, and 3) Cells that underwent anoxia followed by reoxygenation. To measure the effect of A-R on PS exteriorization, bovine pulmonary artery endothelial cells (BPAECs) and HUVECs underwent the A-R treatment as above. Cells were then incubated with annexin which binds to exposed CM PS, but not internal or unexposed PS. annexin fluorescence was read at 680nm. Next we were interested in the effect of A-R on total cell PS quantity, not just exteriorized PS. A-R was induced as described in BPAEC and HUVEC monolayers which were then treated with detergent to open the CM, thereby allowing annexin intracellular access and the ability to measure total PS. Finally, to measure EC permeability, monolayers of BPAECs and HUVECs were formed and confirmed by measuring resistance to confirm tight junction integrity. A-R was induced as described. The apical side of the cells was treated with either PBS (controls) or PBS with biotinylated-bovine serum albumen (BSA), while the basolateral surface contained normal medium. To measure the amount of leaked BSA, solution from the basolateral compartment underwent color reaction.

Results: ATP levels in HUVECs decreased 27% from baseline after 45 minutes of anoxia and decreased further from baseline by 63% after 45 minutes of anoxia followed by 240 minutes of reoxygenation ($p<0.02$). Exteriorized PS doulbed as compared to controls in both BPAECs ($p<0.01$), and HUVECs ($p<0.01$). We also found that during A-R, the total amount of cellular PS increased almost 2-fold in BPAECs ($p<0.01$), and nearly 3-fold in HUVECs ($p<0.01$). This finding that total PS changed 2-fold after A-R suggests that not only is there a change in distribution of PS from the inner to the outer CM, but there may also be an increase in the amount of PS inside the cell, either on the inner CM or within cytosol. Finally, compared to controls, A-R increased monolayer permeability 12-fold in BPAECs ($p<0.01$), and by 37% in HUVECs ($p<0.01$).

Conclusion: Taken together, these data support the idea that EC dysfunction during A-R is associated with: 1) a decrease in ATP levels, 2) PS exposure to the outer CM, 3) an increase in total cellular PS levels, and 4) an increase in monolayer permeability . These data strengthen the notion that PS arrangement in CMs play a critical role in the endothelial dysfunction during cellular stress and may hold the key to potential novel therapies for hemorrhagic shock and ischemia reperfusion injury.

NOTES

Session XVB: Papers 30-38: Basic Science
Paper 35: 3:10-3:30 pm

SELECTIVE AORTIC ARCH PERFUSION WITH FRESH WHOLE BLOOD OR HBOC-201 EFFECTIVELY REVERSES HEMORRHAGE-INDUCED TRAUMATIC CARDIAC ARREST IN A LETHAL MODEL OF NON-COMPRESSIBLE TORSO HEMORRHAGE

Heather E. Hoops MD, James E. Manning MD, Todd L. Graham BS, Belinda H. McCully Ph.D., Shane L. McCurdy BS, James D. Ross Ph.D., Oregon Health & Science University

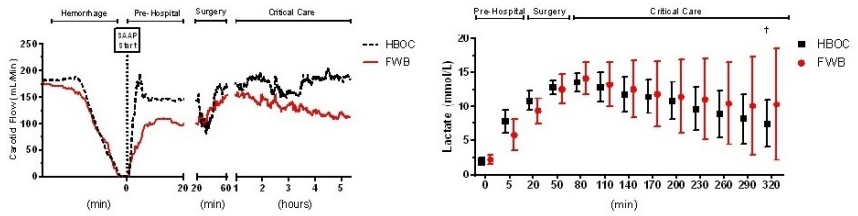
Invited Discussant: Samuel Tisherman, MD

Introduction: Hemorrhage-induced traumatic cardiac arrest (HiTCA) has a dismal survival rate. Previous studies demonstrated selective aortic arch perfusion (SAAP) with fresh whole blood (FWB) improved the rate of return of spontaneous circulation (ROSC) after HiTCA, compared to REBOA and CPR. Hemoglobin-based oxygen carriers, such as HBOC-201, may alleviate the logistical constraints of using FWB in a prehospital setting. It is unknown whether SAAP with HBOC-201 is equivalent in efficacy to FWB, whether conversion from SAAP to Extracorporeal Life Support (ECLS) is feasible, and whether physiologic derangement after HiTCA treated with SAAP therapy is reversible.

Methods: Twenty-six swine (79 ± 4kg) were anesthetized and underwent HiTCA which was induced via a grade V liver injury and controlled hemorrhage. Following 3 minutes of arrest, swine were randomly allocated to resuscitation using SAAP with either FWB (n = 12) or HBOC-201 (n = 14). After SAAP was initiated, animals were monitored for a 20-minute pre-hospital period prior to a 40-minute damage control surgery and resuscitation phase, followed by 260 minutes of critical care. Primary outcomes included rate of ROSC, survival, conversion to ECLS, and correction of physiology.

Results: Baseline physiologic measurements were similar between groups. ROSC was achieved in 100% (12/12) of the FWB animals and 86% (12/14) of the HBOC-201 animals (p = 0.483). Survival (t = 320 min) was 92% (11/12) in the FWB group and 67% (8/12) in the HBOC-201 group (p = 0.120), with 2 exclusions in the HBOC-201 group due to equipment failure. Conversion to ECLS was successful in 100% of both groups. Following hemorrhage, SAAP with HBOC-201 restored carotid flow (CF) to baseline levels at t=20min (p=0.302) and the end of the experiment (p=0.302), which was not seen with FWB (p=0.020, p=0.004). Lactate peaked at 80 minutes after arrest in both groups, and significantly improved by end of experiment in the HBOC-201 group (p = 0.001) but not the FWB group (p = 0.104).

Figure - Pooled data for carotid flow and serum lactate over time



Conclusion: SAAP is effective in eliciting ROSC after HiTCA in a swine model, using either fresh whole blood or HBOC-201. It is feasible to transition from SAAP to ECLS after definitive hemorrhage control, resulting in overall survival greater that 66% in both groups. The physiologic derangements were severe but reversible, with a carotid flow and lactate levels returning to baseline levels by endo of experiment in the HBOC-201 group, but not the FWB group.

NOTES

Session XVB: Papers 30-38: Basic Science
Paper 36: 3:30-3:50 pm

DOES BLOOD TRANSFUSION PRESERVE THE GUT MICROBIOME (GM AFTER TRAUMA? A PROSPECTIVE, CLINICAL STUDY IN SEVERELY INJURED PATIENTS

Susannah E. Nicholson MD, MSCI, Taylor R. Johnson BS, David M. Burmeister Ph.D., Yi Zou Ph.D., Zhao Lai Ph.D., Shannon Scroggins MS, Mark DeRosa Rachelle B. Jonas RN, Daniel R. Merrill BS, Caroline Zhu Larry M. Newton MS, Ronald M. Stewart* MD, Martin G. Schwacha Ph.D., Donald H. Jenkins* MD, Brian J. Eastridge* MD, University of Texas Health Science Center at San Antonio

Invited Discussant: Mitchell Cohen, MD

Introduction: Traumatic injury can lead to a compromised intestinal epithelial barrier, inflammation and immune derangements. The impact of trauma on gut microbial composition is unknown. Alterations in the GM of the critically injured may contribute to infectious or inflammatory complications and influence clinical outcomes. Our objective was to determine if the gut microbiome is altered in severely injured patients and to characterize the microbial composition of the gut over time following trauma.

Methods: We conducted a prospective, observational study in adult patients (n=72) sustaining severe injury admitted to a Level I Trauma Center. Healthy volunteers (n=13) were also enrolled. Fecal specimens were collected on admission to the Emergency Department (ED) and at 1, 3, and 7 days (±2 days) following injury. Microbial DNA was isolated from all fecal samples for 16s rRNA sequencing. GM analysis and taxonomic classification were performed using the QIIME Greengenes 16S rRNA gene database (OTUs; 97% similarity). Alpha and β-diversity were estimated using the observed species metrics.

Results: Characteristics of our study population are shown in Table 1. The GM profile was altered within 30 minutes following injury compared to healthy volunteers (Fig. 1). Patients with an unchanged GM on admission arrived to the ED faster and were transfused more RBCs than those with an altered GM (Table 1). The GM composition among the majority of subjects returned to a profile similar to the healthy volunteers by Day 5. Despite the observed trends in the β-diversity, the total number of species was similar between admission and healthy samples but decreased over time thereafter, signifying loss of α-diversity during hospitalization. Injured patients on admission had a decreased abundance of traditionally beneficial microbial families compared to healthy controls ($p<0.05$). In contrast, an increased abundance in opportunistic families in the injured patients was noted on admission compared to healthy controls ($p< 0.05$).

Conclusion: The human GM changes as early as 30 minutes following injury with additional dysbiosis occurring during the hospital stay. The GM in patients receiving large quantities of RBCs was preserved on admission suggesting a potential protective effect on microbial profile by reducing gut ischemia. Ultimately, the GM of trauma patients may provide valuable diagnostic and therapeutic strategies for the improvement of outcomes post-injury.

	Control	Total	GM Changed	GM Not Changed	p value
# of subjects	13	72	52 (72%)	20 (28%)	
Age	43	44	45	43	0.89
# of Females	6 (46%)	25 (35%)	17 (33%)	6 (30%)	0.23
# of Blunt		57 (79%)	42 (81%)	15 (75%)	0.58
# of Penetrating		15 (21%)	10 (19%)	5 (25%)	0.58
ISS		21	20	22	0.34
Shock Index		0.95	1.02	0.84	0.18
RBCs (units)		6	3	10	0.0002
Transport Time (min)			28	24	<0.0001

Table 1. Characteristics of our study population reported as means (percentages). Shock Index refers to heart rate divided by systolic blood pressure. Transport time is the time (min) taken to transport patients from the scene until arrival in the ED. Units of RBCs transfused were significantly higher, and transport time was significantly lower in patients whose GM was not different than healthy controls.

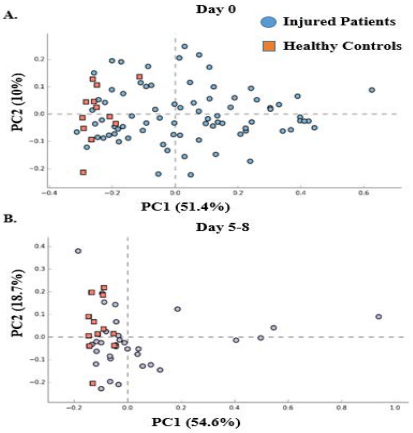


Figure 1. A. Principle components analysis (PCA) of injured patients on Day 0 (blue) compared to healthy controls (red) reveals 2 distinct GM characteristics. B. PCA of injured patients on Day 5-8 (blue) compared to controls (red).

NOTES

Session XVB: Papers 30-38: Basic Science
Paper 37: 3:50-4:10 pm

PRECIOUS CARGO: NEURO-ENTERIC MODULATION OF THE MESENTERIC LYMPH EXOSOME PAYLOAD AFTER HEMORRHAGIC SHOCK

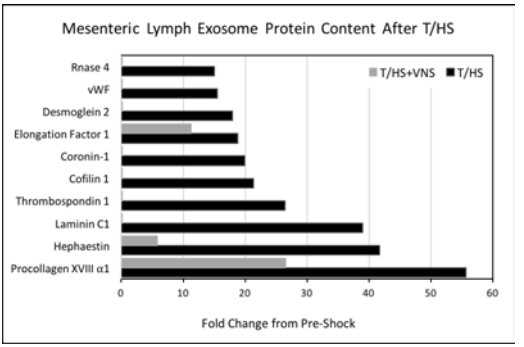
Elliot C. Williams MD, Raul Coimbra* MD, Theresa W. Chan MD, Andrew Baird Ph.D., Brian Eliceiri Ph.D., Todd W. Costantini* MD, University of California, San Diego

Invited Discussant: Jason Smith, MD

Introduction: Trauma/hemorrhagic shock (T/HS) causes a release of pro-inflammatory mediators into the mesenteric lymph (ML) that triggers a systemic inflammatory response and can result in organ failure. Recently we showed that exosomes in post-shock ML are biologically active mediators of this inflammation, but the specific inflammatory mediators in post-shock ML exosomes have yet to be characterized. To this end, we hypothesized that T/HS leads to production of a distinct ML pro-inflammatory exosome phenotype that could be identified by mass spectrometry analysis of exosome proteins. We further hypothesized that their regulation by the neuro-enteric axis via the vagus nerve would modify this pro-inflammatory profile.

Methods: Male rats underwent cannulation of the femoral artery, jugular vein, and ML duct. T/HS was induced by laparotomy and 60 minutes of HS (mean arterial pressure 35 mm Hg) followed by resuscitation with shed blood and two times shed blood volume of normal saline. ML was collected for 1 hour before HS (pre-shock) and for two hours after resuscitation (post-shock). A subset of animals underwent cervical vagus nerve electrical stimulation (VNS) immediately after the HS phase. Ultra-high-pressure liquid chromatography with tandem mass spectroscopy (LC-MS/MS) followed by protein identification and label free quantification was performed on exosomes from the pre-shock and post-shock phases in the T/HS and T/HS+VNS groups.

Results: Seven hundred and forty-three unique proteins were identified in ML exosomes from T/HS rats. Thirty-three proteins were found to be statistically significantly increased in exosomes in the post-shock phase relative to pre-shock (see Figure). Procollagen type XVIII (Col18a1, 56-fold), Hephaestin (Heph, 42-fold), Laminin C1 (Lamc1, 39-fold), and Thrombospondin 1 (Thbs1, 26-fold) showed the greatest increase in ML exosomes after T/HS. Gene Ontology analysis of the increased proteins revealed significant functional enrichments in the "Response to Stress" biological process in the T/HS group. Stimulation of the vagus nerve following injury attenuated the T/HS-induced inflammatory phenotype of ML exosomes, with protein expression similar to pre-shock and no significant enrichments in Gene Ontology analysis.



Conclusion: The protein payload of ML exosomes changes after T/HS with an increase in proteins involved in the response to stress. Stimulating the neuro-enteric axis alters the biological activity of ML exosomes by attenuating this change.

NOTES

Session XVB: Papers 30-38: Basic Science
Paper 38: 4:10-4:30 pm

ACUTE RESUSCITATION WITH POLYETHYLENE GLYCOL-20K: A THROMBOELASTOGRAPHIC ANALYSIS

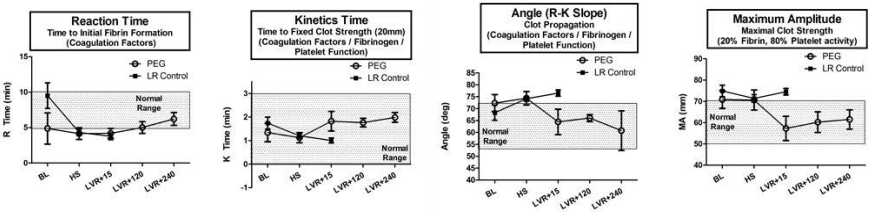
Niluka A. Wickramaratne BS,MD, Kristine Kenning MD, Heather Reichstetter LVT, Charles Blocher MS, Ru Li Ph.D., Michel Aboutanos* MD,MPH, Martin Mangino Ph.D., Virginia Commonwealth University

Invited Discussant: Jeremy Cannon, MD

Introduction: Polyethylene glycol-20,000Da (PEG-20k) is a synthetic polymer with impermeant and colloidal properties that is highly effective for resuscitation in animal models of shock. Its proposed mechanism involves prevention of metabolic swelling by energy independent osmotic water transfer, moving water out of the cell and into the capillary space. In rodents, PEG-20k increases tolerance to the shocked state after severe hemorrhage by 6-8 fold compared to controls. However, thromboelastography (TEG) showed an abnormal hypocoagulable effect on human blood that was treated ex-vivo with a 10% volume dose of PEG-20k. The objective of this study was to determine the in-vivo effects of PEG-20k on coagulation and peak plasma levels in a preclinical porcine model of hemorrhagic shock. We hypothesize that any coagulation effect of PEG-20k will be dependent on the peak blood levels after resuscitation.

Methods: Anesthetized juvenile Yorkshire pigs underwent femoral vessel cannulation and laparotomy to simulate soft tissue trauma. They were then hemorrhaged (MAP held 30-40 mmHg) until either the lactate reached 7 mmol/L, 115 minutes of hemorrhage time had passed, or 50-55% of their estimated blood volume (EBV) was removed. The pigs then underwent low volume resuscitation (LVR) with either a 10% PEG-20k solution (100mg/ml) containing a FITC-labelled PEG-20k marker or Lactated Ringers (LR) as a control (n=5 in each group), both delivered at a volume equal to 10% of the EBV. Whole blood TEG analysis was performed after the surgery (baseline, BL), after hemorrhage (HS), and 15, 120, and 240 minutes (LVR+15, 120, 240) after resuscitation, if the animals survived that long. Plasma samples were serially collected after resuscitation and plasma PEG-20k concentration was determined by fluorescence indicator dilution. Other outcomes included survival time. Of note, all studies were arbitrarily terminated at 240 minutes due to the acute nature of the experiment.

Results: Pigs given low volume resuscitation with PEG-20k were able to survive 3 times longer than LR volume controls ($p<0.001$). This was a marked underestimation because of termination at 240 minutes in the PEG group. Coagulation and platelet function analysis using TEG was limited to the 15 minute post-resuscitation time point in the control group due to lack of survival. Trauma and hemorrhage induced a slightly hypercoagulable state on individual TEG parameters, R Time, K Time, Angle, and Maximum Amplitude (MA). However, these normalized after LVR with PEG-20k, but not LR (Figure). For example, the Coagulation Index (CI), which is a compilation of R, K, Angle, and MA, rose to an average of 3.3 (normal -3 to 3) after hemorrhage in both groups, but normalized to 0.1 fifteen minutes after PEG-20k administration. The CI continued to rise to 4.8 fifteen minutes after LVR with LR alone. The plasma concentration of PEG-20k peaked at an average of 3.58 mg/ml and had a half-life of 138 minutes. The peak plasma concentration was 3-fold lower than predicted by simple dilution (10 mg/ml), which is likely responsible for the lack of abnormal TEGs after in-vivo PEG-20k administration.



Conclusion: These data demonstrate that acute resuscitation with PEG-20k not only improves tolerance to hypovolemia but also normalizes the initial hypercoagulative state of trauma and shock. Although PEG-20k may interfere with coagulation and platelet function, when given at an effective dose for resuscitation, it does not induce a hypocoagulable TEG profile due to much lower in-vivo plasma concentrations than predicted.

NOTES

Session XVIII: Coagulation - Papers # 39-44

Friday, September 28, 2018, 7:30 AM-9:30 AM

Location: Seaport D-H, Second Level (Seaport Tower)

Moderator: Martin Schreiber, MD

Recorder: Sharon Henry, MD

Session XVIII: Papers 39-44: Coagulation
Paper 39: 7:30-7:50 am

MICROVESICLES GENERATED FOLLOWING TRAUMATIC BRAIN INJURY INDUCE PLATELET DYSFUNCTIONVIA ADP RECEPTOR

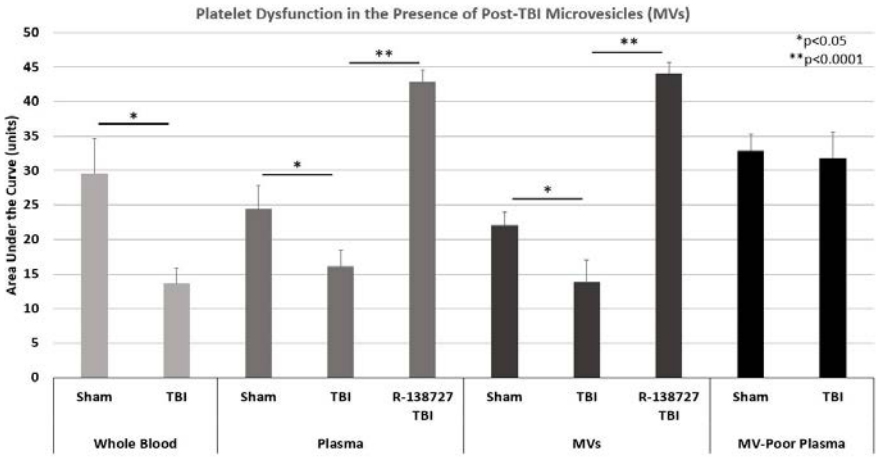
Grace E. Martin MD, Amanda Pugh MD, Rose Veile BS, Lou Ann Friend RVT, Amy T. Makley MD, Charles C. Caldwell Ph.D., Timothy A. Pritts* MD,Ph.D., Michael D. Goodman MD, University of Cincinnati

Invited Discussant: John Holcomb, MD

Introduction: Traumatic brain injury (TBI) can result in an acute coagulopathy including platelet dysfunction that can contribute to ongoing intracranial hemorrhage. Previous clinical studies have shown ADP-induced platelet aggregation to be reduced after TBI. In addition, circulating microvesicles are increased following TBI and have been shown to play a role in post-TBI coagulopathy. We hypothesized that post-TBI microvesicles would affect platelet aggregation in a murine head injury model.

Methods: Moderate concussive TBI was performed using an established weight-drop method in anesthetized mice. Sham mice underwent anesthesia without TBI. Whole blood, plasma, microvesicles, and microvesicle-poor plasma were isolated from blood collected 10 minutes following TBI or sham. Post-TBI plasma, microvesicles, and microvesicle-poor plasma were mixed separately with whole blood from uninjured mice. Platelet aggregation was measured with Multiplate impedance platelet aggregometry in response to arachidonic acid and adenosine diphosphate (ADP). Platelet contribution to maximum clot formation was calculated using the rotational thromboelastometry extrinsically-activated and fibrin-based extrinsically activated tests. Normal saline was used as a dilution control. The ADP P2Y $_{12}$ receptor inhibitor, R-138727 (100uM, prasugrel active metabolite), was incubated with plasma and microvesicles from post-TBI mice, and platelet inhibition was again measured. To confirm P2Y$_{12}$ presence in post-TBI microvesicles, Western blots were performed and analyzed using densitometry.
Results: Whole blood taken from 10 minute post-TBI mice demonstrated diminished ADP-induced platelet aggregation compared to sham mice (13.6 ± 2.3 vs. 29.5 ± 5.2 units, $p<0.01$). When mixed with normal donor blood, post-TBI plasma induced diminished ADP-induced platelet aggregation compared to sham plasma (16.1 ± 2.3 vs. 24.4 ± 3.5 units, $p<0.05$). The addition of post-TBI microvesicles to uninjured whole blood similarly reduced ADP-induced platelet aggregation compared to sham microvesicles (13.8 ± 3.2 vs. 22.0 ± 2.0 units, $p<0.05$). By contrast, the addition of microvesicle-poor post-TBI plasma to normal blood did not change ADP-induced platelet aggregation and was not different compared to sham microvesicle-poor plasma (31.8 ± 3.8 vs. 32.8 ± 2.5 units, $p>0.9$). No differences were observed in the ability of arachidonic acid to induce platelet aggregation. Thromboelastometry demonstrated no difference in the platelet contribution to maximum clot formation after addition of sham and post-TBI microvesicles. The observed dysfunction in post-TBI ADP platelet aggregation was prevented by the pretreatment of post-TBI plasma with 100uM R-138727 (46.8 ± 1.5 units, $p<0.0001$ compared to post-TBI plasma). Treatment of post-TBI microvesicles with R-138727 resulted in similar findings of improved ADP-induced platelet aggregation compared to non-treated post-TBI microvesicles (42.8 ± 1.8 units vs. 13.8 ± 3.2 units, $p<0.0001$). Inhibition of ADP-induced platelet aggregation was also was mitigated by freezing the post-TBI microvesicles prior to whole blood treatment (44.0 ± 1.7 units frozen vs. 13.8 ± 3.2 units fresh, $p<0.0001$). Western blots of post-TBI microvesicles demonstrated the presence of the ADP P2Y$_{12}$ receptor.

Conclusion: ADP-induced platelet aggregation is inhibited acutely following TBI in a murine model. This platelet inhibition is reproduced in normal blood by the introduction of post-TBI plasma and microvesicles. Furthermore, platelet inhibition is abrogated by post-TBI plasma and microvesicle treatment with an inhibitor of the P2Y$_{12}$ ADP receptor. Clinically observed post-TBI platelet dysfunction may therefore be explained by the presence of the ADP P2Y$_{12}$ receptor within post-TBI microvesicles and may represent a future therapeutic target for TBI patients.



NOTES

Session XVIII: Papers 39-44: Coagulation
Paper 40: 7:50-8:10 am

GUIDELINE-BASED CORRECTION OF PLATELET INHIBITION IN TBI PATIENTS IS ASSOCIATED WITH IMPROVED MORTALITY

Andrew B. Sorah MD, Kyle Cunningham MD, Colleen Karvetski Ph.D., Michael Ekaney Ph.D., Rita Brintzenhoff MD, Susan Evans* MD, Carolinas Medical Center

Invited Discussant: Michael Cripps, MD

Introduction: Platelet dysfunction has been demonstrated following traumatic brain injury (TBI) regardless of the use of platelet inhibitors. The purpose of this study is to determine the efficacy of a platelet mapping thromboelastography (PM-TEG) based guideline in predicting traumatic brain injury (TBI) patients who would benefit from platelet transfusion. We hypothesized that adenosine diphosphate (ADP) and Arachadonic Acid (AA) inhibition in patients with TBI is associated with increased mortality and can be corrected with platelet transfusion.

Methods: This is a retrospective review of patients admitted to a Level I trauma center from January 2016 through September 2017 with moderate to severe TBI (msTBI), defined by an initial GCS ≤13 with intracranial hemorrhage. According to our guideline, patients with msTBI receive PM-TEG. Those patients who demonstrate platelet dysfunction (either ADP or AA inhibition ≥60%) receive 1 apheresis pack of platelets followed by repeat PM-TEG, until inhibition <60% or maximum 3 packs of platelets transfused. Cohorts were defined as patients without (NPI) and with (PI) platelet inhibition, and subdivided into those whose inhibition corrected after transfusion (PI-C) versus those whose inhibition did not correct (PI-NC). Outcome variables (mortality, length of stay (LOS), and venous thromboembolism (VTE) were compared for all groups. Patient age, APACHE IV Score and ISS were utilized for risk adjustment.

Results: A total of 240 patients received PM-TEG during the timeframe of the study; NPI n= 85, PI-NC n= 39, PI-C n= 36. Patients who did not receive f/u PM-TEG result after transfusion were excluded from analysis n=26. Patients who were inhibited at baseline, but did not receive platelets (n= 54) were included as a subgroup in the analysis. Platelet inhibition was associated with increased mortality (PI = 43.2% vs. NPI = 29.4%), with a 1.8x increased likelihood of mortality after controlling for ISS and age (p=0.05). There was no difference in LOS among survivors between the inhibited and non-inhibited groups (NPI = 14(8,29) vs. PI=18(12,27); p=0.48). Among patients with platelet inhibition at baseline, mortality was greater if platelet transfusion did not result in correction of inhibition (PI-NC = 56.4% vs. PI-C = 22.2%) with an OR of death = 4.8 after adjusting for age and ISS (p=0.006; 95% CI [1.6,14.4]). In addition, the subset of patients who were inhibited at baseline but did not receive platelets had a mortality rate twice that of patients who were transfused and corrected (44.4% vs 22.2%), with an OR of 3.6 [1.3,11.5] after correcting for ISS and age (p=0.02). LOS among survivors and rate of VTE were not different between these groups.

Condition	N	Mortality Rate (%)	Predicted Hospital Mortality (%) (APACHE)	Mortality O/E (APACHE)	APACHE Score (avg;SD)	ISS (avg;SD)	Age (avg; SD)	VTE	LOS among survivors (median;[IQR])
Not Inhibited at Baseline	85	29.4	31.1 (18.8)	0.99 (n=75)	75.1 (23.9)	25 (11)	47 [36,63]	0 (0.0%)	14 [8,29]
Inhibited, no platelets	54	44.4	32.6 (20.5)	1.25 (n=49)	78.0 (24.9)	25 (12)	44 [29,64]	1 (1.9%)	14 [7,22]
Inhibited, platelets, not corrected in protocol	39	56.4	38.7 (23.5)	1.38 (n=34)	85.3 (27.3)	32 (14)	47 [26,62]	0 (0.0%)	23 [18,33]
Inhibited, platelets, corrected in protocol	36	22.2	27.9 (14.2)	0.92 (n=28)	76.1 (19.9)	29 (14)	41 [29,54]	3 (8.3%)	17 [14,29]

Conclusion: Platelet inhibition in patients with moderate to severe TBI is associated with higher mortality and guideline directed correction of platelet inhibition is associated with improved survival. Additional study of the mechanisms involved in this association is warranted. A multicenter trial utilizing this guideline would aid in external validation.

NOTES

Session XVIII: Papers 39-44: Coagulation
Paper 41: 8:10-8:30 am

Platelet Derived Extracellular Vesicles are Equivalent to Platelets with Respect to Hemostasis and Vascular Permeability

Shibani Pati MD,Ph.D., Byron Miyazawa BS, Daniel R. Potter Ph.D., Ernesto E. Lopez MD, Amit K. Srivastava Ph.D., Charles E. Wade* Ph.D., Martin A. Schreiber* MD, John B. Holcomb* MD, University of California, San Francisco

Invited Discussant: Susan Evans, MD

Introduction: Platelet extracellular vesicles (Plt-EVs) have the potential to alleviate the logistical difficulties associated with platelet transfusion. Plt-EVs are membrane vesicles (50-1000nm) which are shed from platelets. Plt-EVs can be stored frozen and have demonstrated hemostatic properties. Circulating platelets, in addition to hemostasis, function to stabilize the vasculature and inhibit endothelial cell (EC) permeability. We hypothesized that Plt-EVs would have therapeutic effects on permeability similar to fresh platelets and plasma (FFP). To investigate this hypothesis we used *in vitro* and *in vivo* models of vascular endothelial compromise and bleeding.

Methods: ***In vitro:*** EVs from FFP and platelets were isolated by ultracentrifugation. EVs were characterized for platelet markers (CD41b and CD62P) by flow cytometry. Human lung microvascular endothelial cells (HMVEC-L) were utilized for assessment of endothelial barrier function by changes in trans-EC electrical resistance (TEER). ECs were treated with Plts (25 X10 ^{3}/ml), Plt-EVs and FFP-EVs (70 µg/ml) and FFP (2%). EC tight junction breakdown induced by thrombin was assessed by staining for VE-Cadherin. ***In vivo*:** *Vascular Permeability:* A Miles assay was used to study the effects of the test groups on permeability induced by VEGF-A in immunodeficient NOD-SCID mice (n=5 mice/group). Mice were injected with test sample: 200 µl saline, Plts (3 X10^8), Plt-EVs (30 µg), FFP (200 µl) and FFP-EVs (30 µg). VEGF-A was injected in the dorsal skin to induce vascular leak of Evan's blue dye (EBD) which was quantitatively assessed. *Bleeding Model:* Tail snip assays in NOD-SCID mice were conducted with the same test groups (n=5 mice/group). Blood loss was measured. Statistical significance between groups was determined in all studies via one way ANOVA post hoc tukey tests.

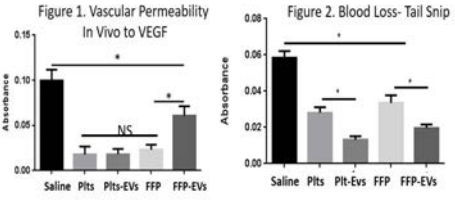


Figure 1. Miles assay NSG mice- Platelet Extracellular Vesicles (Plt-Evs) decreased vascular permeability similar to Fresh Platelets. **Figure 2.** Tail snip model of blood loss. Plt-Evs demonstrate superior hemostatic function compared to Plts. * indicates p<0.05.

Results: ***In vitro***: Flow cytometry confirmed that 90% of the Plt-EVs and FFP-EVs were of platelet origin. Plts and Plt-EVs both decreased EC monolayer permeability and restored EC tight junctions after thrombin challenge similar to FFP. Area under the curve measurements of TEER reveal that Plts and FFP are potent inhibitors of permeability and their EVs also decrease permeability (Resistance readings of the EC monolayer: Control: 0.69 ± 0.0067, Plts: 0.82 ± 0.029, FFP: 0.85 ± 0.0051, Plts-EVs: 0.74 ± 0.0038, FFP: 0.73 ± 0.026). All groups statistically increase TEER compared to control. ***In vivo:*** In a Miles assay of vascular leak**,** we observed that Plts, FFP and Plt-EVs have similar inhibitory effects on vascular permeability (**Figure. 1**). In the tail snip bleeding assay, we found that Plt-EVs decreased blood loss and demonstrated superior hemostatic properties compared to Plts and FFP **(Figure 2**).

Conclusion: Plt-EVs can be important for achieving hemostasis and attenuating vascular permeability in trauma. These findings indicate that Plt- EVs may be used in lieu of Plts and provide a novel product that is logistically superior for transfusion in diverse settings.

NOTES

Session XVIII: Papers 39-44: Coagulation
Paper 42: 8:30-8:50 am

Tranexamic acid as a risk factor for post-traumatic venous thromboembolism: results from a propensity matched cohort study

Sara P. Myers MD, MA, MS, Matthew E. Kutcher* MD, Matthew R. Rosengart* MD,MPH, Jason L. Sperry* MD,MPH, Joshua B. Brown* MD, MSc, Matthew D. Neal* MD, University of Pittsburgh

Invited Discussant: Adrian Maung, MD

Background: Trauma remains a leading cause of mortality worldwide. Hemorrhage control addresses the primary cause of early preventable deaths: bleeding. Tranexamic acid (TXA) is used as a hemostatic adjunct, but may promote serious complications such as venous thromboembolic (VTE) disease. Previous studies investigating the effect of TXA on VTE vary in their findings and the population of interest. We aim to investigate the association between TXA and VTE through a propensity matched retrospective cohort analysis, hypothesizing that TXA is an independent risk factor for VTE.

Methods: We conducted a retrospective study of all trauma patients presenting to a single level I trauma center during the period January 2012 to December 2016 to determine the association between TXA and risk of VTE. Our primary outcome was composite pulmonary embolus or deep vein thrombosis. Secondary outcomes included mortality, transfusion requirement, ICU length of stay, and hospital length of stay. We analyzed the data using a propensity matched mixed effects multivariate logistic regression to determine the adjusted odds ratio (aOR) and 95% confidence intervals (95% CI) of the association between TXA and our outcomes of interest, adjusting for differences in prespecified confounders. A competing risks regression model was used to determine subdistribution hazard ratio (SHR) of VTE after accounting for mortality as a competing risk. A p-value <0.05 was considered significant.

Results: A total of 189 matched pairs were included from a population of 21,931 patients. Subject pairs were well matched across propensity score variables (standardized differences <0.1). Median ISS was 19 (IQR 12, 27) in the TXA group, and 14 (IQR 8,22) in the non-TXA group (p=0.41). TXA was associated with more than 3-fold increase in the odds of VTE (aOR 3.3; 95%CI 1.3-9.1, p=0.02). TXA was not associated with survival (aOR 0.86; 95%CI 0.23-3.25, p=0.827). Risk of VTE remained elevated in patients treated with TXA despite accounting for mortality as a competing risk (SHR 2.42; 95% CI 1.11-5.29, p=0.027). Patients who received TXA experienced longer ICU (9.4 vs. 6.5 days, p<0.001) and hospital length of stays (18.2 vs. 10.9 days, p<0.001).

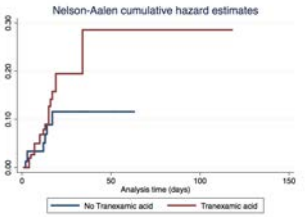
Conclusion: TXA may be an independent risk factor for VTE development without conferring survival benefit. Future investigation is needed to identify which injured patients have a survival advantage from TXA, especially given the risks of this intervention, to allow a more individualized treatment approach that maximizes benefits and mitigates potential harms.

Table 1: Characteristics of treated and untreated matched patients.

Characteristic	Treated N=189	Untreated N=189	p-value
Age, median (IQR)	36 (24-53)	32 (22-55)	0.33
Female, n (%)	47 (25%)	57 (30%)	0.23
HR (bpm), median (IQR)	130 (114, 141)	119 (104, 132)	0.41
SBP (mm Hg), median (IQR)	83 (70, 98)	84 (71-98)	0.95
ISS, median (IQR)	19 (12, 27)	14 (8, 22)	0.19
Hemoglobin (g/dL), median (IQR)	9 (7.5, 10.9)	8.6 (7.2,10.8)	0.50
Unadjusted survival, n (%)	136 (72%)	161 (85%)	0.04

N= total number of patients within a cohort; n= number of patients with baseline characteristic; IQR= interquartile range; HR= heart rate; bpm= beats per minute; SBP= systolic blood pressure; ISS= injury severity score; CI= confidence interval; VTE= venous thromboembolic event.

Figure 1: Cumulative hazards estimates of venous thromboembolic events among patients who received tranexamic acid compared to those who did not.



NOTES

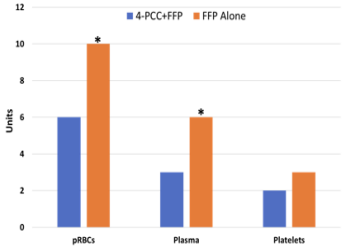
Session XVIII: Papers 39-44: Coagulation
Paper 43: 8:50-9:10 am

4-FACTOR PROTHROMBIN COMPLEX CONCENTRATE IMPROVES SURVIVAL IN TRAUMA: A NATIONWIDE PROPENSITY MATCHED ANALYSIS

Muhammad Zeeshan MD, Mohammad Hamidi MD, Lynn Gries Muhammad Khan MD, Ara J. Feinstein* MD, Joseph Sakran* MD,MPH, Terence O'Keeffe* MD, Narong Kulvatunyou* MD, Bellal Joseph* MD, University of Arizona - Tucson

Invited Discussant: Matthew Martin, MD

Introduction: Post-traumatic hemorrhage or Exsanguination is the most common preventable cause of death in trauma patients. Numerous small single-center studies have shown that 4-PCC+FFP is superior to FFP alone in the resuscitation of trauma patients. The aim of our study was to evaluate outcomes of severely injured trauma patients who received 4-PCC+FFP compared to FPP alone.
Methods: We performed a 2-year (2015-2016) retrospective analysis of the ACS-TQIP. All adult (age≥18y) trauma patients who received 4-PCC+FFP or FFP alone were included. We excluded patients who were on preinjury anticoagulants. Patients were stratified into two groups: 4-PCC+FFP vs. FFP alone and were matched in a 1:1 ratio using propensity score matching for demographics, ED vitals, injury parameters, and hemorrhage control intervention. Outcome measures were pRBC, plasma & platelets units transfused, thromboembolic complications, and mortality.
Results: We analyzed 593,818 trauma patients, of which 118,940 patients met inclusion criteria. A total of 468 patients (4-PCC+FFP: 234, FFP alone: 234) were matched. The mean age was 50±21y; 70% were males, median ISS was 27 [20–36], and 87% had blunt injuries. 4-PCC+FFP was associated with a decreased requirement for pRBC units (6 units vs. 10 units; p=0.02) and FFP transfusion (3 units vs. 6 units; p=0.01) compared to FFP alone (**Fig 1**). There was no difference in the rates of thromboembolic complications; namely DVT (p=0.11) & PE (p=0.33), between the two groups (**Table 1.**). Patients who received 4-PCC+FFP had lower mortality (17.4% vs 27.7% p=0.01) **Fig 2**.
Conclusion: Our study demonstrates that the use of 4-factor PCC as an adjunct to FFP is associated with improved survival and reduction in transfusion requirements compared to FFP alone in the resuscitation of severely injured trauma patients. Further studies are required to evaluate the potential role of the addition of PCC to massive transfusion protocols.



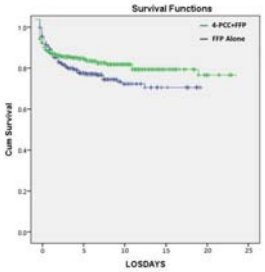


Table 1. Outcomes

Variables	4-PCC+FFP (n=234)	FFP alone (n=234)	*P-value*
Blood products			
pRBC transfused, units	6 ± 4	10 ± 4	0.02
FFP, units	3 ± 2	6 ± 3	0.01
Platelets, units	2 ± 3	3 ± 3	0.72
Thromboembolic complications			
DVT	3.6%	5.5%	0.11
PE	1.1%	1.8%	0.33
SNF/Rehabilitation	39.1%	38.4%	0.21
Mortality	17.4%	27.7%	0.01

INR = International Normalized Ratio, PRBC = Packed Red blood cells, FFP = fresh frozen plasma, DVT = Deep venous thrombosis, PE = Pulmonary embolism.

NOTES

Session XVIII: Papers 39-44: Coagulation
Paper 44: 9:10-9:30 am

DESMOPRESSIN IS A TRANSFUSION SPARING OPTION TO REVERESE PLATELET DYSFUNCTION IN PATIENTS WITH SEVERE TRAUMATIC BRAIN INJURY

Elisa Furay MD, Mitchell J. Daley PharmD, Praveen N. Satarasinghe BS, Pedro Teixeira MD, Thomas B. Coopwood* MD, Marc D. Trust MD, Jayson D. Aydelotte MD, Carlos V. Brown* MD, Dell Seton Medical Center At The University Of Texas

Invited Discussant: Susan Rowell, MD

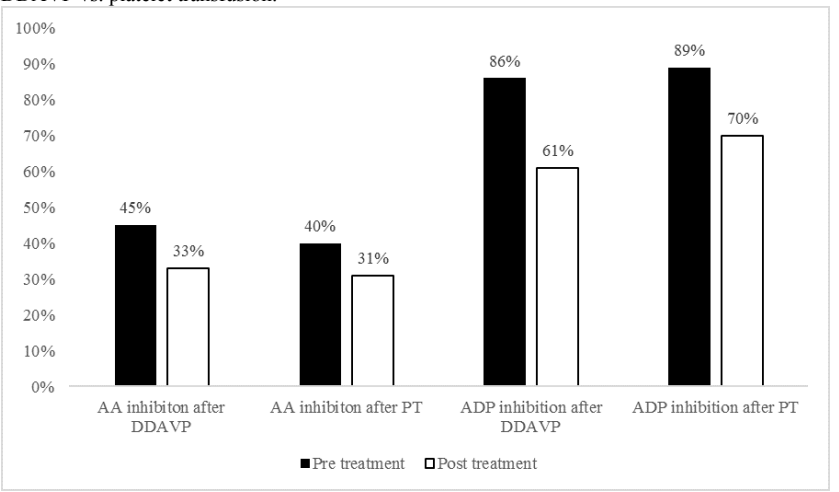
Introduction: Platelet dysfunction is an independent predictor of increased mortality in patients with severe traumatic brain injury (TBI). Platelet transfusions have been shown to be an effective treatment strategy to reverse platelet inhibition and reduce mortality, but may be associated with shortages, cost and transfusion related complications. Therefore, desmopressin (DDAVP) is an attractive alternative to enhance platelet aggregation. We hypothesized that DDAVP would correct platelet dysfunction similarly to platelet transfusions in patients with severe TBI.

Methods: This retrospective study evaluated all blunt trauma patients admitted to an urban, level one trauma center from July 2015 to October 2016 with severe TBI (Head AIS >/= 3) who presented with platelet dysfunction (defined as adenosine diphosphate (ADP) inhibition greater than 60% on thromboelastogram [TEG]) and subsequently received treatment. Per our institutional practice patients with severe TBI and platelet dysfunction are transfused a unit of apheresis platelets to reverse inhibition. If platelet inhibition persists the patient receives a second platelet transfusion. During a platelet shortage, we interchanged DDAVP for the initial treatment. Patients were classified as receiving DDAVP or platelet transfusion (PT) based on the initial treatment. Patients were excluded if hemostatic agents were given prior to first TEG or DDAVP was co-administered with the platelet transfusions.

Results: A total of 57 patients were included (DDAVP [n=23]; PT [n=34]). When comparing the DDAVP group to the PT group there was no difference in age (41 vs. 40, p=0.86), male gender (82% vs. 74%, p=0.44), but PT patients were more often Caucasian (94% vs. 65%, p=0.005). There was no difference in admission systolic blood pressure (138 vs. 142, p=0.68) or pulse (97 vs. 105, p=0.30). Patients who received DDAVP were more severely injured (ISS: 29 vs. 23, p=0.045) but there was no difference in Head AIS (4 vs. 4, p=0.16). Prior to treatment both groups had similar admission platelet counts (276 vs. 256, p=0.70) as well as arachidonic acid (AA) and ADP inhibition as measured by TEG, AA (45% vs. 40%, p=0.58) and ADP (86% vs. 89%, p=0.34). After treatment both the DDAVP and PT groups had similar correction of platelet inhibiton along the AA (p=0.80) and ADP (p=0.28) pathways (Figure 1).

Conclusion: In patients with severe TBI and platelet dysfunction, DDAVP is an alternative to platelet transfusions to correct platelet dysfunction.

Figure 1: Change in platelet inhibition along the AA (p=0.80) and ADP (p=0.28) pathways for DDAVP vs. platelet transfusion.



NOTES

Session XIX: Coagulation - Papers #45-47

Friday, September 28, 2018, 9:45 AM-10:45 AM

Location: Seaport D-H, Second Level (Seaport Tower)

Moderator: Raminder Nirula, MD, PhD

Recorder: Oscar Guillamondegui, MD

Session XIX: Papers 45-47: Coagulation
Paper 45: 9:45-10:05 am

A Novel Platelet Function Assay for Trauma

Mitchell J. George MD, Charles E. Wade Ph.D., Charles S. Cox* Jr., MD, Brijesh S. Gill MD,
McGovern Medical School

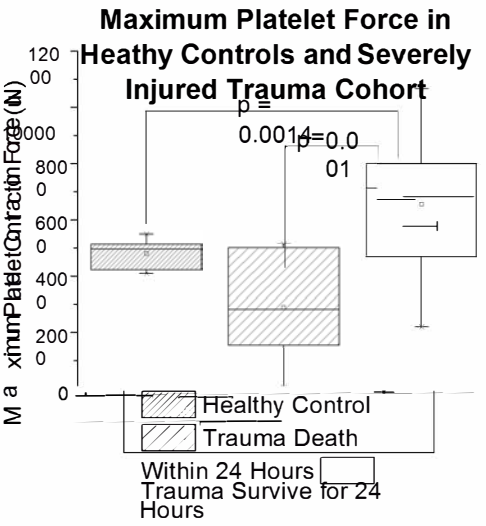
Invited Discussant: Jordan A. Weinberg, MD

Background: Platelet function tests like thromboelastography platelet mapping and impedance aggregometry have demonstrated significant reductions in platelet function in all trauma patients. However, these two tests correlate poorly with one another and require reagents like arachidonic acid or adenosine diphosphate for activation. In this study we introduce a platelet function test that measures platelet contraction forces directly, the platelet contraction assay (PCA), without pathway specific reagents. Platelet contraction is the final phase of platelet activation and requires energetic substrates to drive actin-myosin crosslinking. We hypothesize that this platelet function test will correlate with established coagulation tests like thromboelastography (TEG), demonstrate significant differences between healthy subjects and trauma patients, and identify critically ill trauma patients.

Methods: Initial blood samples from eighty Level 1 Trauma patients with median ISS of 13 (4, 17) were assayed in the PCA and compared to their initial TEG data using regression analysis. Blood from ten healthy subjects was assayed seperately to establish a reference range. Results from trauma patients surviving beyond 24 hours after admission were compared to healthy controls and trauma deaths within 24 hours after admission using analysis of variance (ANOVA) with Tukey post-hoc analysis. The primary PCA metric was maximum platelet contraction force (MF). The PCA measures platelet contraction forces in whole blood that clots between two plastic discs in a heated chamber.

Results: The PCA MF correlates with TEG MA with R^2=0.756 according to a power curve regression of all eighty trauma patients. Trauma patients that survived for 24 hours after arrival (N=74) demonstrated significantly elevated maximum platelet contraction forces compared to healthy controls (6,705±2370 versus 4,825±480 µNewtons, p=0.0014) and trauma patients that died within 24 hours (6,705±2370 versus 2,904±2122 µNewtons, p=0.001). Those that died within 24 hours demonstrated non-significant decreases compared to healthy controls (2,904±2122 versus 4,825±480 µNewtons, p=0.11). Of the six that died, four were from brain injury and two from blunt trauma.

Conclusions: The PCA is a platelet specific assay that correlates well with TEG MA and predicts early mortality in severely injured trauma patients. Unlike thromboelastography platelet mapping and impedance aggregometry, the PCA demonstrates increased platelet function in trauma patients unless they die within 24 hours. An explanation for this difference is that platelet contraction is reflective of platelet metabolics and thus a potential biomarker for survival after trauma.



NOTES

Session XIX: Papers 45-47: Coagulation
Paper 46: 10:05-10:25 am

TRANEXAMIC ACID CAUSES A ROBUST AND PROLONGED FIBRINOLYTIC SHUTDOWN

Julia R. Coleman MD,MPH, Ernest E. Moore* MD, Angela Sauaia MD,Ph.D., Jason M. Samuels MD, Geoffrey R. Nunns MD, Gregory R. Stettler MD, Joshua Ryon BA, Arsen Ghasabyan MPH, James Chandler Anirban Banerjee Ph.D., Christopher C. Silliman MD,Ph.D., Kenneth L. Jones Ph.D., University of Colorado Denver

Invited Discussant: Nicholas Namias, MD, MBA

Introduction: Tranexamic acid (TXA), an antifibrinolytic, has been used in military and civilian trauma, but its preemptive utility has been called into question over mixed evidence of survival benefit and increased thromboembolism. This study examines the changes in fibrinolysis over time after TXA administration in trauma patients. We hypothesize that TXA causes conversion to fibrinolytic shutdown which could have thromboembolic consequences.

Methods: The Trauma Activation Protocol study is a prospective study of all trauma activation patients admitted to a Level 1 Trauma Center. Whole blood samples were collected at scene or upon presentation and at 2, 4, 6, 12, 24 and 48 hours. Citrated rapid thrombelastography (TEG) was performed. LY30 (% lysis 30 minutes after maximum amplitude) was examined and lysis phenotypes were defined as fibrinolytic shutdown (LY30<0.9%), physiologic lysis (0.9%≥LY30<3.0%) and hyperfibrinolysis (LY30≥3.0%). LY30 was compared at each time point between patients who received TXA versus those who did not using a Mann-Whitney test, as well as through propensity matched analysis to control for covariates. The incidence of venous thrombo-embolic events (VTE) was examined by chi-square analysis.

Results: Overall, 274 patients were included. The median age was 31.4 years and 79% were male. 59% presented after blunt trauma and the median new injury severity score (NISS) was 33. 41 patients (15%) received TXA. Patients who received TXA had a higher level of tissue injury (NISS of 43 vs 29, p=0.01) and more severe shock (base deficit of -14.0 mEq/L vs -8.0 mEq/L, p<0.0001). TXA patients had more severe clot breakdown on admission compared to non-TXA patients (median LY30 8.2% vs 1.2%, p<0.0001). By two hours, the median LY30 of TXA patients decreased to 0.3% (vs 0.7% in non-TXA patients) and by hour 4, the median LY30 of TXA patients reflected complete fibrinolytic shutdown with an LY30 of 0.0% (vs non-TXA patients' LY30 of 0.6%, p=0.02). Remarkably, the complete inhibition of lysis among TXA patients persisted at 24 hours, with median LY30 of 0.0% in TXA patients compared to 0.6% in non-TXA patients (p=0.005). Even when controlling for baseline differences, degree of shock and tissue injury, LY30 was still significantly lower in the TXA group (p=0.05). Patients who received TXA had a trend towards increased rate of VTE (10% compared to 5% in non-TXA patients), although this did not reach statistical significance (p=0.27).

Conclusion: TXA causes a more robust and prolonged conversion to fibrinolytic shutdown in trauma patients compared to patients who do not receive TXA, a conversion which persists to at least 24 hours. Although TXA reverses the hyperfibrinolytic profile, it results in overcorrection with a transition to fibrinolysis shutdown within four hours of administration. This may put patients at a higher risk for VTE, which is strongly associated with fibrinolytic shutdown.

NOTES

Session XIX: Papers 45-47: Coagulation
Paper 47: 10:25-10:45 am

EARLY FIBRINOLYSIS SHUTDOWN IS ASSOCIATED WITH INCREASED NEUROSURGICAL INTERVENTIONS AFTER TRAUMATIC BRAIN INJURY: IS SHUTDOWN AN EARLY MARKER OF HYPOCOAGULABILITY RATHER THAN HYPOFIBRINOLYSIS?

Johana C. Gomez-Builes MD, Ori D. Rotstein MD, FRCP, Andrew Baker MD, Sergio A. Acuna MD,Ph.D., Andrea Petropolis MD, FRCP, Mostafa Alwash MD, Arshpreet Gulati MD, Ghassan Alkefeiri MD, Alan Rechamberg Ziroldo Estevao Pardi Sandro Rizoli* MD,Ph.D., FACS, FRCP St Michael's Hospital

Invited Discussant: Martin Schreiber, MD

Introduction: Following a traumatic brain injury (TBI), patients' outcome depends on the severity of the primary brain damage and the secondary brain insults, including intracranial hemorrhage progression (IHP). Coagulopathies, such as excessive fibrinolysis, have been associated with IHP and the need for neurosurgical intervention (NSX), but the association of hypofibrinolysis or fibrinolysis shutdown with IHP and NSX has not been studied.

Methods: A retrospective cohort of patients with moderate to severe TBI (AIS head≥ 2), admission ROTEM™, and serial imaging (CT head at admission and within 48 hours). Clinical, laboratory and CT findings were reviewed, including the type of intracranial hemorrhage (ICH), and number of ICH. IHP was defined as any new hemorrhage or worsening of admission-ICH. Patients were classified according to fibrinolysis phenotypes (physiologic, hyperfibrinolysis and shutdown). ROTEM™ ML<3.5% was used to define shutdown (as recently published by our group). Univariable and multivariable logistic regression evaluated the association between shutdown and progression, NSX, and mortality.

Results: 173 patients were included. 41.6% had IHP and 18% had a NSX. Predominant fibrinolysis phenotype was physiologic (71%), followed by shutdown (25.4%) and hyperfibrinolysis (3.4%). Shutdown patients had higher ISS, lower base excess and required more transfusions than the physiologic group. Progression was independently associated with fibrinogen level (OR 1.3, 95%CI:1.02-1.65, p= 0.03), INR (OR 0.5, 95% CI: 0.3-0.9, p= 0.04), and Glasgow Coma Scale motor response (GCSM, OR:1.38; 95% CI: 1.1-1.72, p= 0.003), but not with shutdown (OR 1.12; 95%CI: 0.4-2.5; p= 0.78), platelets, age, or acidosis. Shutdown (OR 3.1; 95%CI:1.8-8.2, p=0.02) and the number of ICH (OR 1.5, 95%CI: 1-2.4, p= 0.04) were independently associated with NSX. Platelets, fibrinogen level, INR, age, acidosis, GCSM, IHP were not associated with NSX. Age (OR1.4; 95%CI: 1.1-1.7, p=0.0008), GCSM (OR: 2.2; 95%CI: 1.5-3.2, p <0.0001), NSX (OR 5.6; 95%CI: 1.2-24.7, p=0.02), were independently associated with mortality. IHP (p=0.06), acidosis (p=0.06), and shutdown (p=0.9) were not associated with mortality.

Conclusions: This is the first study to explore the association between early fibrinolysis shutdown and progression of intracranial hemorrhage, and the need for neurosurgery. We found an independent association of shutdown with the need for NSX, which could be explained by a significant hemostatic activation (increased clot formation with fibrinogen consumption, and higher transfusions needs) rather than hypofibrinolysis. Fibrinolysis shutdown as an early marker of hypocoagulability could facilitate the recognition of patients at risk of neurosurgical interventions and thus, assist in the reduction of the secondary brain damage.

NOTES

44TH WILLIAM T. FITTS, JR., M.D., LECTURE

William T. Fitts, Jr., M.D.
October 6, 1915 - June 17, 1984

William T. Fitts, Jr. was born on October 6, 1915, in Jackson, Tennessee. He received his A.B. degree from Union University in Jackson in 1937 and his M.D. degree from the University of Pennsylvania in 1940. He was an intern resident, Harrison Fellow in Surgical Research, Rockefeller Foundation Fellow in Surgery and Instructor in Surgery at the University of Pennsylvania from 1940-1942 and from 1945-1947. From 1942-1945, he was a Surgical Ward Officer in the Affiliated Unit of the University of Pennsylvania, the 20th General Hospital, in the China-Burma-India Theatre of World War II. He became an Assistant Professor of Surgery in 1949, Associate Professor of Surgery in 1952, and was John Rhea Barton Professor of Surgery and Chairman, Department of Surgery, University of Pennsylvania, from 1972-1975. He spent his entire career at the University of Pennsylvania. Because of his long service to the organization, the Fitts Lecture was established by the American Association for the Surgery of Trauma in 1974 and first presented by Curtis P. Artz, M.D. at the 35th AAST Meeting in Scottsdale, Arizona.

****

American Association for the Surgery of Trauma:
Secretary, Vice-President, President-Elect, 1957-1964
President, 1964-1965
Editor, Journal of Trauma, 1968-1974

American College of Surgeons:
Vice-Chairman, Committee on Trauma, 1965-1966
Chairman, Pennsylvania Committee on Trauma, 1955-1967
National Safety Council Surgeon's Award for Distinguished Service to Safety, 1971

American Trauma Society:
President, 1972-1973

Friday, September 28, 2018
10:55-11:55 AM
Session XX: Fitts Lecture
Location: Seaport D-H, Second Level (Seaport Tower)

Damage Control and Firearm Deaths: "A Tale of Two Cities!"

C. William Schwab, MD, FACS, FRCS (H) Glas.
Emeritus Professor of Surgery, Perelman School of Medicine

Founding Chief, Division of Traumatology
Surgical Critical Care & Emergency Surgery

Senior Consultant
Penn Medicine
University of Pennsylvania
Philadelphia, PA, U.S.A.

PREVIOUS FITTS ORATORS

1. 1975 Curtis P. Artz, M.D.
Charleston, SC

2. 1976 Francis D. Moore, M.D.
Boston, MA

3. 1977 G. Tom Shires, M.D.
New York, NY

4. 1978 Lloyd D. MacLean, M.D.
Montreal, Quebec, Canada

5. 1979 Mr. Peter S. London
Birmingham, England

6. 1980 Carl T. Brighton, M.D.
Philadelphia, PA

7. 1981 John W. Kinney, M.D.
New York, NY

8. 1982 Thomas W. Langfitt, M.D.
Philadelphia, PA

9. 1983 Col. Robert Scott, L/RAMC
London, England

10. 1984 F. William Blaisdell, M.D.
Sacramento, CA

11. 1985 Donald P. Becker, M.D.
Los Angeles, CA

12. 1986 Sheng Chih-Yong, M.D.
Woods Hole, MA

13. 1987 Paul Dudley Hart
Woods Hole, MA

14. 1988 Roderick A. Little, M.D.
Manchester, United Kingdom

15. 1989 Prof. Martin Allgower, M.D.
Switzerland

16. 1990 Philip R. Lee, M.D.
San Francisco, CA

17. 1991 Donald D. Trunkey, M.D.
Portland, OR

18. 1992 Basil A. Pruitt, Jr., M.D.
Fort Sam Houston, TX

19. 1993 John H. Davis, M.D.
Burlington, VT

20. 1994 John R. Border, M.D.
Buffalo, NY

21. 1995 Jonathan E. Rhoads, M.D.
Philadelphia, PA

22. 1996 Susan P. Baker, M.P.H.
Baltimore, MD

23. 1997 George F. Sheldon, M.D.
Chapel Hill, NC

24. 1998 Leonard Evans, Ph.D.
Warren, MI

25. 1999 Barbara Barlow, M.D.
New York, NY

26. 2000 Johannes A. Sturm, M.D.
Hannover, Germany

27. 2001 Janet Reno
Washington, DC
(Cancelled)

28. 2002 C. James Carrico, M.D.
Dallas, TX

29. 2003 Ellen J. MacKenzie, Ph.D.
Baltimore, MD

30. 2004 Colonel John Holcomb, M.D.
Ft Sam Houston, TX

31. 2005 Sylvia D. Campbell, M.D.
Tampa, FL

32. 2006 Sten E.V. Lennquist, M.D., Ph.D.
Linkoping, Sweden

33. 2007 Thomas M. Scalea, M.D.
Baltimore, MD

34. 2008 Charles E. Lucas, M.D.
Detroit, MI

35. 2009 Frederick P. Rivara, M.D., M.P.H.
Seattle, WA

36. 2010 Charles N. Mock, M.D., Ph.D., M.P.H.
Seattle, WA

37. 2011 H. Leon Patcher, M.D.
New York, NY

38. 2012 David B. Hoyt, M.D.
Chicago, IL

39. 2013 Frank R. Lewis, Jr., M.D.
Philadelphia, PA

40. 2014 Ronald G. Tompkins, M.D.
Boston, MA

41. 2015 L.D. Britt, M.D., M.P.H.
Norfolk, VA

42. 2016 M. Margaret Kundson, M.D.
San Francisco, CA

43. 2017 Ronald Maier, M.D.
Seattle, Washington

Friday, September 28, 2018
1:30 PM-2:00 PM
Session XII: Master Surgeon Lecture II
Location: Seaport D-H, Second Level (Seaport Tower)

*A*dvise, *A*dvance, *S*upport, *T*each -
The True Meaning of ***AAST*** *To Me*

Christine Gaarder, MD, PhD
Head of Department
Department of Traumatology
Oslo Univeristy Hospital Ulleval (OUHU)

Session XXIIIA: Plenary Session - #48-56

Friday Septermber 28, 2018, 2:00 PM-5:00 PM

Location: Seaport D-H, Second Level (Seaport Tower)

Moderator: Christoph Josten, MD

Recorder: Andre Campbell, MD

Session XXII: Papers 48-56
Paper 48: 2:00-2:20 pm

A NOMOGRAM PREDICTING THE NEED FOR BLEEDING INTERVENTIONS AFTER HIGH-GRADE RENAL TRAUMA: RESULTS FROM THE AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA (AAST GENITOURINARY TRAUMA STUDY

Sorena Keihani MD, Douglas M. Rogers MD, Bryn E. Putbrese MD, Kaushik Mukherjee* MD, Sarah Majercik* MD, Christopher M. Dodgion* MD,MPH, Scott A. Zakaluzny* MD, Brian P. Smith* MD, Jurek F. Kocik* MD, Matthew M. Carrick* MD, Reza Askari* MD, Angela P. Presson Ph.D., James M. Hotaling MD, Raminder Nirula* MD,MPH, Jeremy B. Myers MD, University of Utah

Invited Discussant: Neil Parry, MD

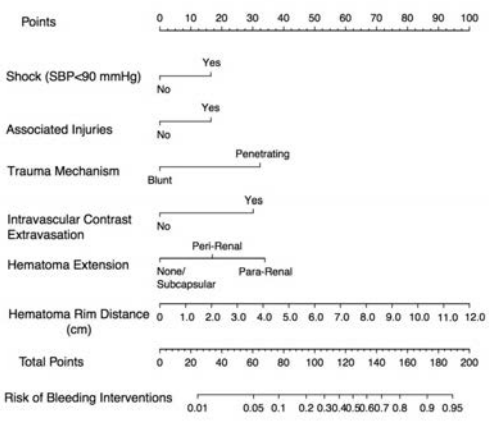
Introduction: The management of high-grade renal trauma (HGRT) and the indications for intervention remain poorly defined. The American Association for the Surgery of Trauma (AAST) renal grading is a broad categorization of injury severity and does not incorporate clinical and radiologic variables important in clinical decision-making especially around bleeding interventions. We aimed to use data from our multi-institutional study, incorporating both clinical and radiologic parameters, to develop a nomogram predicting risk of bleeding interventions after HGRT.

Methods: From 2014 to 2017, data on adult HGRT (AAST grades III-V) were collected from 14 participating Level-1 trauma centers. Patients with both clinical and radiology data were included. Data were gathered on demographics, injury characteristics, management, and outcomes. Clinical parameters, easily obtained and previously shown to be associated with bleeding interventions included: (1) trauma mechanism, (2) shock (systolic blood pressure <90 mmHg), (3) associated injury (i.e. any concomitant injury, including: solid organ, gastrointestinal, spinal cord, major vascular, and pelvic fracture), (4) admission lactate levels, and (5) admission hemoglobin level. Initial CT-scans were reviewed by two radiologists to extract renal injury specifics which included: (1) intravascular contrast extravasation (ICE), (2) hematoma rim distance (HRD, i.e. largest measure from the edge of the kidney to the hematoma), and (3) hematoma extension (none/subcapsular; peri-renal; para-renal [beyond the aorta on the left or IVC on the right or into the pelvis]), and (4) laceration location (lateral, medial, complex). Bleeding interventions included: nephrectomy (total or partial), renorrhaphy, renal packing, and renal-related angioembolization. We developed a prediction model by applying backward model selection to a logistic regression model that included the above mentioned clinical and radiologic variables. We developed a nomogram for the selected model and reported its accuracy as the area under the receiver operating characteristic curve (AUC) and its 95% confidence interval (CI).

Results: A total of 326 patients from the overall cohort of 431 met the inclusion criteria. Mechanism of injury was blunt in 81%, and 67% had one or more associated injuries. Mean age and injury severity score were 35.0±16.6 and 25.0±12.6. Injuries were reported as AAST grades III (60%), IV (33%), and V (7%). Overall, 47 (14%) underwent bleeding interventions including 19 renal angioembolization 16 nephrectomies, and 12 other procedures. ICE was found in 73 patients (23%). Hematoma extension was peri-renal in 160 (49%) and para-renal in 123 (38%); 43 (13%) had no hematoma or only subcapsular hematoma. Mean HRD in the horizontal plane was 2.1 cm (SD: 2.0). The nomogram for our bleeding intervention prediction model is presented in Figure-1. Of the clinical and radiologic variables entered in backward model selection, lactate, hemoglobin, and laceration location did not significantly improve the nomogram AUC, and were not included in the final model. Having a HRD of 12 cm was worth the most points (100), followed by para-renal hematoma extension (34 points), penetrating trauma mechanism (32 points), ICE (30 points), associated injuries (16 points), and shock (16 points). The AUC was 0.88 (95% CI: 0.83–0.92).

Conclusion: We developed a nomogram that integrates multiple clinical and radiologic factors immediately available upon assessment of the trauma victim and can provide predicted probability for risk of bleeding interventions after HGRT. While further studies are needed to validate our model, this nomogram may help in guiding appropriate interventions such as decreasing unnecessary interventions especially at lower volume trauma centers with limited experience with high-grade renal injuries.

Figure 1. Nomogram for our model predicting bleeding intervention



NOTES

Session XXII: Papers 48-56
Paper 49: 2:20-2:40 pm

PRESUMPTIVE ANTIBIOTICS FOR TUBE THORACOSTOMY FOR TRAUMATIC HEMOPNEUMOTHORAX

Susan P. Schultz MD, Chengcheng Hu Ph.D., Alan D. Cook* MD, Jeanette G. Ward MS-CR, Jeremy Juern MD, Geoffrey A. Funk MD, Ronald Gross* MD, David Turay MD, Steven R. Allen MD, Paola G. Pieri MD, Christopher P. Michetti MD, Frederick B. Rogers* MD, Shreya Jammula BS, Forrest O. Moore* MD, AAST ABX IN TUBE THORACOSTOMY STUDY GROUP AAST Multi-Institutional Trials Committee

Invited Discussant: Timothy Fabian, MD

Introduction: Despite more than forty years of investigation, presumptive antibiotic use for post-traumatic tube thoracostomy remains controversial. Researchers seek to balance prevention of infectious complications with antibiotic stewardship. This study investigated the benefit of presumptive antibiotic treatment for prevention of infectious complications following post-traumatic tube thoracostomy. The primary outcomes were pneumonia and empyema following chest tube insertion. Hospital and ICU lengths of stay (HLOS and ICULOS respectively), ventilator days, death and *C*. difficile colitis were secondary endpoints.

Methods: A prospective, observational, multi-center study included 1,887 subjects from 22 level I trauma centers. Nearest neighbor matching balanced covariate distributions in the treatment (ABX) and control (NoABX) groups. Variables used for matching included basic demographics, trauma center information, mechanism of injury, severity of injury, and details of chest tube placement.

Results: There were 272 patients in each group. No significant differences among matching covariates distinguished either group. No significant differences were found in primary outcomes between the ABX and NoABX groups. Pneumonia was diagnosed in 15.4% and 9.9% of the ABX and NoABX group, respectively, p=0.07. Similarly, 2.2% of the ABX group and 1.5% of the NoABX patients developed empyema, p=0.75. ICULOS was one day longer in the ABX group, p=0.02.

Binary Outcome	No ABX	ABX	Odds Ratio (OR) (95% CI)
Empyema	4 (1.5%)	6 (2.2%)	1.5 (0.42, 5.32)
Pneumonia	27 (9.9%)	42 (15.4%)	1.68 (0.99, 2.85)
Death	29 (10.7%)	24 (8.8%)	0.82 (0.47, 1.43)
Clostridium Difficile Colitis	3 (1.1%)	2 (0.7%)	0.67 (0.11, 3.99)
Count Outcome			**Rate Ratio (RR) (95% CI)**
ICU LOS*	2 (0, 6)	3 (0, 9)	1.27 (0.97, 1.68)
Hospital LOS	7 (4, 14)	8 (4, 16)	1.11 (0.96, 1.28)
Ventilation Days	0 (0, 3)	1 (0, 5)	1.36 (0.92, 2.01)

*$p<0.05$

Conclusion: This study found no evidence to support the use of presumptive antibiotics for post-traumatic tube thoracostomy in the absence of other indications.

NOTES

Session XXII: Papers 48-56
Paper 50: 2:40-3:00 pm

VASOPRESSOR USE IN SPINAL CORD INJURY INCREASES MORTALITY AND COMPLICATIONS WITHOUT IMPROVING SHORT TERM NEUROLOGIC FUNCTION

Caitlin A. Fitzgerald MD, Faiz U. Ahmad MD, Peter M. Rhee* MD, Bryan C. Morse* MD, Mark L. Shapiro* MD, Jonathan Nguyen DO, Sebastian D. Perez MSPH, Christian M. Mustroph MD, Griffin R. Baum MD, Rondi B. Gelbard MD, Emory University

Invited Discussant: David Zonies, MD, MPH

Introduction: An increase in spinal cord perfusion pressure is thought to improve neurologic outcomes after spinal cord injury (SCI) but this has yet to be shown in trauma patients. According to guidelines, vasopressors should be used to achieve a goal mean arterial pressure (MAP) to optimize spinal cord blood flow. However, the outcomes and complications associated with routine vasopressor use among SCI patients are not well established. The purpose of this study was to determine the outcomes associated with vasopressor use among SCI patients.

Methods: This was a retrospective review of all adult patients presenting to our Level 1 Trauma Center with acute traumatic SCI between September 2010 and September 2017. Patients were identified from the Trauma Registry using the International Classification of Diseases (ICD-9) codes for spinal cord injury. Patients were grouped according to whether they received vasopressors for MAP goals or not. Outcome measures included complications, hospital and Intensive Care Unit (ICU) length of stay (LOS), and change in American Spinal Injury Association (ASIA) impairment scale from admission to discharge.

Results: A total of 535 patients with SCI were identified. Of these, 113 (21.1%) had normal neurologic function on admission and were excluded from further analysis. A total of 55.4% (234/422) received vasopressors to achieve MAP goals >85 mmHg for an average of 4.6 days. Whether patients received MAP goals or not was based on surgeon's preference. There was no difference between the vasopressor and no vasopressor groups in terms of demographics. ASIA Grades at admission ranged from 168 (39.8%) ASIA A, 40 (9.5%) ASIA B, 84 (20%) ASIA C, and 116 (27.5%) ASIA D. There was no difference in short term neurologic improvement in ASIA A-D patients with the use of vasopressors. Overall mortality was higher among patients receiving vasopressors (25/234, 10.7% vs 2/174, 1.1%, p=0.001). Even after controlling for ISS and ASIA scores, vasopressors were independently associated with a significant increase in mortality (OR= 8.87, p=.004). Hospital and ICU LOS were also significantly longer in the vasopressor group (28 ±35 vs. 19.1±29 days, p=0.007, and 18±21.2 vs. 7.8 ± 8.9 days, p<0.001), as were cardiogenic complications such as myocardial infarction, acute kidney injury, sepsis, pneumonia and urinary tract infections.

	Vasopressor (n=234)	No Vasopressor (n=174)	p-value
ICU LOS	18.0 ± 21.2	7.8 ± 8.9	**<0.001***
Hospital LOS	28.0 ± 35.0	19.1 ± 29.2	**0.007***
Mean ASIA at Admission	2.1 ± 1.2	2.8 ± 1.3	**<0.001***
Mean Change in ASIA			
A	0.20 ± 0.63	0.16 ± 0.46	0.7
B	0.39 ± 0.69	0.33 ± 0.89	0.9
C	0.32 ± 0.47	0.51 ± 0.61	0.09
D	0.10 ± 0.48	0.22 ± 0.45	0.2
AKI	20 (8.5%)	3 (1.7%)	**0.003***
Sepsis	26 (11.1%)	2 (1.1%)	**<0.001***
Pneumonia	81 (34.6%)	25 (14.4%)	**<0.001***
UTI	31 (13.2%)	37 (21.3%)	**0.03***
Cardiac Arrest	28 (12.0%)	4 (2.3%)	**<0.001***
Mortality	25 (10.7%)	2 (1.1%)	**0.001***

AKI: acute kidney injury; UTI: urinary tract infection.
Table 1. Comparison of outcomes between SCI patients who received vasopressors and those who did not.

Conclusion: Although vasopressors may be of benefit in patients with SCI, our data shows an association with increased morbidity and mortality without improving short term neurologic recovery. Prospective studies are required to determine the potential long-term benefits, risks and costs of vasopressor use for achieving MAP goals in patients with SCI.

NOTES

Session XXII: Papers 48-56
Paper 51: 3:00-3:20 pm

PREHOSPITAL END TIDAL CO2: A SUPERIOR MARKER FOR MORTALITY RISK IN THE ACUTELY INJURED PATIENT

Robert G. Willis MD, MS, Kyle W. Cunningham* MD,MPH, Troia P. Algarin BS, Ashley S. Gutierrez BS, Ashley B. Christmas* MD, Rita Brintzenhoff* MD, Ronald F. Sing* DO, Carolinas Medical Center

Invited Discussant: Saman Arbabi, MD, MPH

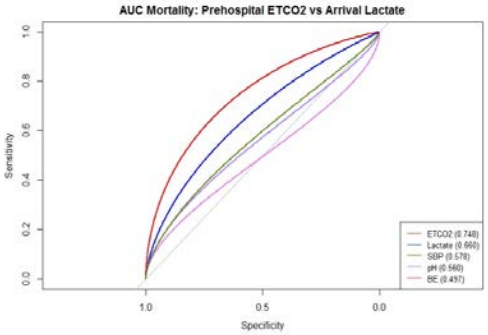
Introduction: Emergency medical personnel must expeditiously triage acutely injured patients to the appropriate medical facility. There continues to be a need for efficient and objective variables to facilitate this process and provide information to the receiving trauma center. Currently, multiple variables are used to prognosticate injury severity and risk of mortality including vital signs, mental status, lactate and base excess. We investigated the prehospital use of end tidal carbon dioxide (EtCO2) as a non-invasive physiologic measure that can be obtained in the acutely injured patient.

Methods: We performed a retrospective analysis of 557 acutely injured patients over two years (January 1, 2014- December 31, 2015) at a level I trauma center. All patients arriving as trauma activations with EtCO2 measurements were included in analysis. EtCO2 measurements were categorized as "low", "normal", and "high" based on standard reference levels. Mortality was the primary outcome. Secondary receiver operator curves (ROC) for base excess, venous lactate, blood pressure, and venous pH were also compared. We hypothesized EtCO2 levels would be able to predict mortality.

Results: EtCO2 levels conferred a mortality rate of 38%, 17.3%, and 2.9% for "low", "normal" and "high" respectively ($p<0.001$). Furthermore, ROC analysis produced an area-under-the-curve (AUC) predictive value for EtCO2 (0.748) which was superior to lactate (0.660), SBP(0.578), pH(0.560), and base excess(0.497).

Table 1. Mortality by End-Tidal CO2 Level (p-value <0.001)

EtCO2	Mortality (%)
Low	38.0
Normal	17.3
High	2.9



Conclusion: EtCO2 is a more sensitive and specific predictor of mortality in the acutely injured patient compared to venous lactate, base deficit, blood pressure, or venous pH. Additional studies are needed to determine if EtCO2 can be used as an effective prehospital adjunct to prevent mortality in acutely injured patients.

NOTES

Session XXII: Papers 48-56
Paper 52: 3:20-3:40 pm

PRE-INJURY PALLIATIVE PERFORMANCE SCALE (PPS PREDICTS FUNCTIONAL OUTCOMES AT 6 MONTHS IN OLDER TRAUMA PATIENTS

Franchesca Hwang MD, Sri Ram Pentakota MD,MPH,Ph.D., Christopher McGreevy MD, Patricia Walling RN, MS, Dorsa Seimaa MPH,RN, Nina E. Glass MD, David H. Livingston* MD, Anne C. Mosenthal* MD, New Jersey Medical School

Invited Discussant: Karen Brasel, MD, MPH

Introduction: Older trauma patients have increased risk of adverse in-hospital outcomes than their younger counterparts. Previously, we demonstrated that low Palliative Performance Scale (PPS) independently predicted poor discharge outcomes. Yet, the ability to predict long-term outcomes beyond discharge is unknown. We hypothesized that pre-injury PPS would predict long-term outcomes in older trauma patients.

Methods: We conducted a prospective observational study of trauma patients aged $\geq$ 55 admitted to a level I trauma center (7/2016-10/2017). Pre-injury PPS, which takes 1-2 minutes to complete, was assessed at admission; low PPS was defined as $\leq$70. Primary outcomes were in-hospital mortality and Extended Glasgow Outcome Scale (GOSE) at discharge and 6 months. Secondary outcomes were patient-reported outcome measures at 6 months: EuroQol (EQ)-5D and 36-Item Short Form Survey (SF-36). Poor functional outcome was defined as GOSE $\leq$ 4. Multivariable logistic regression was performed for each primary outcome, adjusting for PPS, age, race, gender, and injury severity.

Results: We collected 376 patients' in-hospital data. The mean age was 70; the mean ISS was 14.8; and 30% had low PPS. Six percent (n=24) died in hospital (GOSE 1), and half of survivors (n=190) had severe disability (GOSE 3/4) at discharge. No vegetative state (GOSE 2) was observed. Low PPS was associated with in-hospital mortality (aOR 3.0, 95% CI 1.1-8.3) and poor functional outcomes at discharge among survivors (aOR 5.9, 95% CI 3.1-11.0). Severe TBI and ISS also predicted in-hospital mortality. Older age, higher ISS, and lower extremity fractures predicted poor functional outcomes at discharge. Six-month data were available for 113 (87%) of 130 patients who were approached for follow-up. Functional outcomes improved in 62% at 6 months (**Table**). However, 63% had moderate to extreme pain, and 43% felt moderately to extremely anxious/depressed. Low-PPS patients were less likely to improve GOSE than high-PPS patients (40% vs 70%). Low PPS independently predicted poor functional outcomes at 6 months (aOR 5.7, 95% CI 1.5-21.5) while age, ISS, and lower extremity fractures did not. A higher proportion of low-PPS patients had problems with EQ-5D mobility (92% vs 51%, p=0.0002) and usual activities (77% vs 44%, p=0.003); they also scored lower on the EQ-5D Visual Analogue Scale (59 vs 68, p=0.04) at 6 months. Similarly, the low-PPS group scored lower than the high-PPS group in SF-36 physical functioning (27 vs 54, p=0.0004) and general health domains (37 vs 53, p=0.01).

Conclusion: Pre-injury PPS predicts in-hospital mortality and poor functional outcomes at discharge and 6 months in older trauma patients. Patients with low PPS were less likely to improve their functional outcomes after discharge; interestingly, majority of survivors improved their function at 6 months, further emphasizing the importance of long-term follow-up in understanding their true outcomes. Pre-injury PPS is a quick, practical tool that can be utilized on admission for early prognostication of both short- and long-term outcomes.

Table: Change of GOSE over 6-month follow-up, stratified by pre-injury PPS (low: $\leq$70)

6-month Outcomes	Total (n=113)		Low PPS (n=30)		High PPS (n=83)		p-value
Died	7	*6%*	4	*13%*	3	*4%*	0.014
Worsened	13	*12%*	5	*17%*	8	*10%*	
No change	23	*20%*	9	*30%*	14	*17%*	
Improved	70	*62%*	12	*40%*	58	*70%*	

NOTES

Session XXII: Papers 48-56
Paper 53: 3:40-4:00 pm

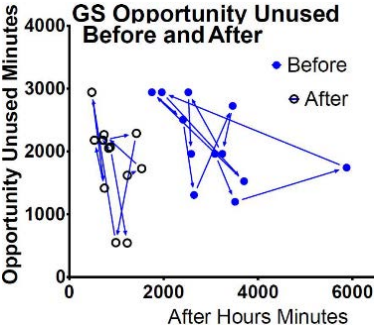
USING PERFORMANCE FRONTIERS TO DIFFERENTIATE ELECTIVE AND CAPACITY-BASED SURGICAL SERVICES

Stephen E. Ranney MD, Loic J. Fabricant MD, Max W. Breidenstein BS, Kevin W. Sexton MD, Ajai K. Malhotra* MD, Mitchell H. Tsai MD, University of Vermont

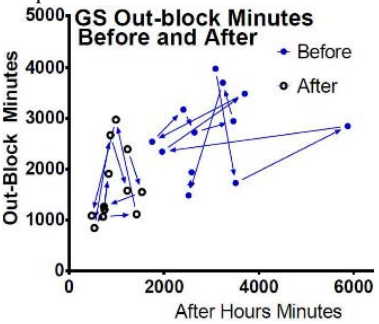
Invited Discussant: Kimberly Davis, MD, MBA

Introduction: In the past, our institution demonstrated how an Acute Care Surgery service (ACS) can improve the clinical productivity of surgical departments (AAST 2016, 2017); however, the application of current productivity models is limited and varied. At our institution, creating an ACS led to increased OR workload and a concomitant decrease in clinical productivity. Current productivity models incorporating over-utilized time may not apply to ACS systems because ACS is a capacity-based service and requires a 24-hour block allocation which falsely decreases productivity. Thus, a new technique to optimize multiple objectives is needed to determine the true utility of implementing ACS. Performance frontiers provide a mathematical and graphical system for evaluating a set of actions to determine optimal efficiency—a state where allocation of resources is optimal and where it is impossible to reallocate any resources without making any objective worse. We hypothesized that ACS and elective general surgery (GS) would differentiate themselves along separate pathways on superimposed performance fronts, and that the implementation of an ACS would help GS reach optimal efficiency.

Methods: We extracted the time for in-block, out-of-block, after-hours, and opportunity-unused for GS and ACS for 12 months prior to and after implementing ACS. Monthly data was plotted along performance fronts and was viewed graphically using GraphPad Prism®. For each month, over-utilized time was plotted on the x-axis and in-block and out-of-block times were plotted on the y-axis.



Results: The performance frontiers demonstrated obvious differences in OR utilization between ACS and GS. Statistically, ACS had a significant increase in opportunity unused minutes. The GS showed a significant decrease in after-hours, out of block, and opportunity unused time. Although not statistically significant, an upward trend of in-block time was observed.



Conclusion: The application of performance fronts to productivity and OR utilization metrics hints at the limitations of the current models. The graphs demonstrate falsely elevated opportunity unused for ACS while showing an increase in GS OR efficiency. This suggests that hospital administrators, OR managers, and physician leaders need different frameworks to understand capacity-based services and to identify limitations of operational efficiency as well as to describe the full value of an ACS model to a whole surgical department, not an individual service. Performance fronts will allow for OR managers to track efficiency of multiple services while making such changes.

NOTES

Session XXII: Papers 48-56
Paper 54: 4:00-4:20 pm

MINIMALLY INVASIVE PREPERITONEAL BALLOON TAMPONADE AND ABDOMINAL AORTIC JUNCTIONAL TOURNIQUET VERSUS OPEN PACKING FOR PELVIC FRACTURE-ASSOCIATED HEMORRHAGE: NOT ALL EXTRINSIC COMPRESSION IS EQUAL

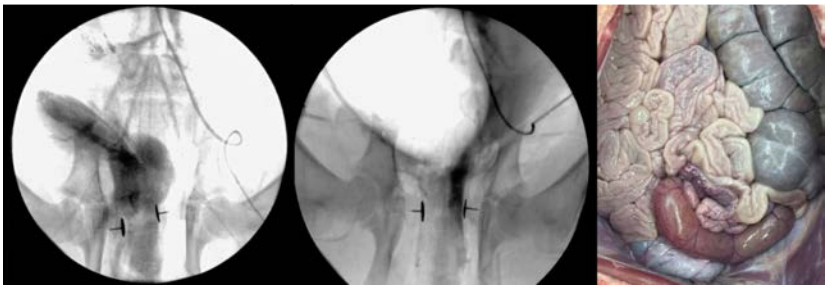
Woo S. Do MD, Dominic M. Forte MD, Rowan R. Sheldon MD, Jessica B. Weiss MD, Morgan R. Barron MD, Kyle K. Sokol MD, George E. Black MD, Matthew J. Eckert MD, Matthew J. Martin* MD, Madigan Army Medical Center

Invited Discussant: Clay Cothren Burlew, MD

Introduction: Minimally invasive preperitoneal balloon tamponade (PPB) and abdominal aortic junctional tourniquets (AAJT) have been proposed as alternatives to open preperitoneal packing (OP) for the management of pelvic fracture associated hemorrhage. We compared the effectiveness of PPB (SpaceMaker Pro™) and AAJT against the standard of care (OP) in an animal model of open-book pelvic fracture.

Methods: 28 swine underwent creation of a combined open-book pelvic fracture and major iliac vascular injuries. Animals were randomized to no intervention (n=7), OP (n=8), PPB (n=7), or AAJT (n=6) at a mean arterial pressure <40 mmHg following initiation of uncontrolled hemorrhage. Hemodynamics, laboratory values, survival time (up to 60 min), preperitoneal pressure, and blood loss were compared between groups.

Results: Prior to injury, no significant difference was measured between groups for variables including weight, hemodynamics, lactate, and hematocrit (all p=NS). The injury was uniformly lethal without intervention, with survival time (mean) of 5 min, peak preperitoneal pressure of 14 mmHg, blood loss of 1010 cc, and peak lactate of 2.6 mmol/L. Mean survival time was 44 min with OP, and was significantly longer at 60 min with PPB and AAJT ($p<0.01$). Peak preperitoneal pressure was 21 mmHg with OP, 24 with PPB, and 23 with AAJT (p=NS). Blood loss was 850 cc with OP, 780 cc with PPB, and 610 cc with AAJT (p=NS). Peak lactate was 3.0 mmol/L with OP, 3.8 mmol/L with PPB, and 6.3 mmol/L with AAJT ($p<0.01$). Necropsy revealed bowel/bladder injury in 50% of AAJT subjects compared to 0% in all other arms ($p<0.01$). The following figure depicts free pelvic hemorrhage on angiography (left); tamponade with PPB inflation (middle); and bowel injury with AAJT (right).



Conclusion: PPB is a safe and more effective alternative to OP for the management of lethal pelvic fracture associated hemorrhage, and has several significant advantages including the ease of bedside placement. The AAJT offers a similar survival benefit to PPB but has concerning rates of compressive abdominal organ injury.

NOTES

Session XXII: Papers 48-56
Paper 55: 4:20-4:40 pm

OUTCOMES FOR POPLITEAL ARTERY INJURY REPAIR AFTER DISCHARGE: A LARGE-SCALE POPULATION-BASED ANALYSIS

William J. Butler MD, Richard Y. Calvo Ph.D., Michael J. Sise* MD, Vishal Bansal* MD, C. Beth Sise MSN, Jason M. Bowie MD, Lyndsey E. Wessels MD, Scripps Mercy Hospital Trauma Service

Invited Discussant: David Feliciano, MD

Introduction: Data suggest that the short-term results after endovascular repair (EvR) versus open repair (OpR) for popliteal artery injury are similar. However, studies on the outcomes after discharge are limited. We evaluated popliteal artery injury repair in a large population-based dataset. We hypothesized that post-discharge outcomes for OpR are superior to EvR.

Methods: Patients with popliteal artery injury were identified in the California Office of Statewide Health Planning and Development 2007-2014 patient discharge database. Popliteal arterial and other lower-extremity skeletal, vascular, and nerve injuries were identified using ICD-9-CM diagnosis codes. Procedure codes were evaluated to identify OpR, EvR, fasciotomy, and lower-extremity amputation. Primary outcomes were in-hospital mortality or amputation during index admission. The association between repair method and each outcome was evaluated with logistic regression. Post-discharge amputation and death were evaluated using survival analysis.

Results: We identified 769 patients with popliteal artery injury. Most were male (85%), mean age was 38.1 (SD: 16.5) years, and median ISS was 13 (IQR: 9 – 21). OpR occurred in 456 (59.3%) patients, EvR in 37 (4.3%), combined EvR and OpR in 18 (2.3%), and non-operative management in 258 (33.6%). Although fasciotomy was performed more frequently in OpR compared to EvR (40.8% vs 18.9%, $p< 0.01$), amputation during the index admission was not significantly different (10.5% vs 2.7%, $p = 0.13$). Arterial embolism or thrombosis during the index admission was more likely after EvR or combined EvR and OpR compared with OpR (24.3%, 55.6% and 16.7% respectively, $p <0.001$). Patients who required both EvR and OpR were 5.18 times (95%CI: 1.39-19.34) more likely to undergo amputation after discharge and 4.44 times (95%CI: 1.27–15.57) more likely to die after discharge compared to patients who only had OpR (median 98.5 days from discharge).

Conclusion: In a large cohort with popliteal artery injury, OpR was associated with lower rates of arterial thrombus or embolism and both amputation and mortality after discharge. Our results suggest that OpR is superior and that EvR needs to be carefully evaluated to determine its appropriate use in managing popliteal artery injuries.

NOTES

PAPER 56 - WITHDRAWN

NOTES

Session XXIIIB: Plenary Session - Papers #57-65

Friday, September, 28, 2018, 2:00 PM-5:00 PM

Location: Seaport A-C, Second Level (Seaport Tower)

Moderator: M. Margaret Knudson, MD

Recorder: Addison May, MD

Session XXIII: Papers 58-65
Paper 57: 2:00-2:20 pm

APPLICATION OF EMR-DERIVED ANALYTICS IN CRITICAL CARE: ROTHMAN INDEX PREDICTS MORTALITY AND READMISSIONS IN SURGICAL ICU PATIENTS

Abdul Q. Alarhayem MD, Mark T. Muir* MD, Donald Jenkins* MD, Brian J. Eastridge* MD, Maulik Purohit MD,MPH, Basil A. Pruitt* Jr., MD, Ramon F. Cestero* MD,
University of Texas Health Science Center at San Antonio

Invited Discussant: Sonlee West, MD

Introduction: The Rothman Index (RI) is an objective measurement of a patient's overall condition, automatically and continuously calculated from clinical data in the electronic medical record (EMR). A maximum score of 100 reflects no additional mortality risk, and a decreasing score signifies a deteriorating clinical status. Although studies in medical patients suggest that RI scores may predict mortality and readmission rates, RI has not been extensively evaluated in the surgical population. This study assessed the validity of RI in predicting surgical ICU (SICU) readmission rates and mortality. We hypothesized that lower pre-transfer RI scores are associated with higher mortality and SICU readmission rates.

Methods: We conducted a single-center retrospective analysis over a two-year period at a Level I trauma center which included surgical patients who were transferred from the SICU to the surgical floor. Data included demographics, length of stay (LOS), mortality, and RI at multiple pre-transfer time points (72, 48, and 24 hours before transfer) as well as 24 and 48 hours post-transfer. Patients readmitted to the SICU within 48 hours of transfer were compared with patients who did not require readmission within 48 hours (control).

Results: A total of 1,445 SICU patients were transferred to the surgical floor; 79 patients (5.5%) were readmitted within 48 hours of transfer. Demographics were similar in both groups. Mean age was 52, and 67% were male. Compared to controls, patients readmitted to the SICU within 48 hours experienced higher LOS (29 vs 11 days, $p<.05$) and higher mortality (2.5% vs 0.6%, $p<.05$). Patients requiring readmission also had a lower RI at 72, 48, and 24 hours before transfer as well as at 24 and 48 hours after transfer ($p<.05$ for all). Additionally, patients requiring readmission had less improvement in RI scores during the immediate 24 hours after transfer (1 vs 17, $p<.05$). In trauma patients ($n = 719$), lower RI scores at 24 hours prior to transfer correlated with an increase in ISS and mortality ($p<0.05$). Patients transferred with RI scores > 83 did not require SICU readmission within 48 hours. The AUC value of RI for predicting mortality, calculated from the receiver operator characteristic (ROC) curve, was 0.865 with standard errors of 0.05.

Conclusion: SICU patients requiring readmission within 48 hours of transfer to a surgical floor have a significantly higher mortality and longer LOS compared to those who do not. Patients requiring readmission also have significantly lower pre- and post-transfer RI scores compared to those who do not. Lower RI values at 24 hours before transfer are predictive of higher readmission rates and increased mortality risk, and patients with pre-transfer RI scores >83 are unlikely to require early SICU readmission. As an EMR-derived composite clinical measurement, RI scores may be used as a tool for evaluating patients prior to SICU downgrade, and can assist in identifying patients at higher risk for mortality and ICU readmission. Prospective studies are warranted to further validate use of this technology.

NOTES

Session XXIII: Papers 58-65
Paper 58: 2:20-2:40 pm

Predisposed to Failure? The Challenge of Rescue in the Medical Intensive Care Unit

Alexandra Briggs MD, Robert Handzel MD, Matt Kutcher MD, Andrew B. Peitzman* MD, Raquel Forsythe* MD, University of Pittsburgh

Invited Discussant: Lena Napolitano, MD, MPH

Introduction: Patients in the Medical Intensive Care Unit (MICU) develop acute surgical processes that require operative intervention. While the increased mortality in emergency general surgery (EGS) patients is established, there are limited data addressing outcomes in the MICU population. The aim of our study was to characterize the breadth of surgical consults from the MICU and assess the mortality of patients requiring EGS.

Methods: All patients with an EGS consult originating from the MICU in a large urban academic medical center between January 2010 and 2016 were identified from a prospective, electronic medical record-based acute care surgery registry. Charts were reviewed to determine the reason for consult and the surgical procedures performed. Descriptive statistics were used to characterize patient demographics and outcomes for both the entire cohort and patients who underwent abdominal operations.

Results: Over this six year period, 911 MICU patients were seen by our service, 578 (63.4%) for an abdominal consult question, 333 (36.6%) for a non-abdominal question. A total of 411 patients (45.1%) underwent an operative procedure (186 abdominal, 225 non-abdominal). Patients undergoing abdominal operations had a mean age of 59.6, 53.2% male. The postoperative unadjusted mortality rate in patients undergoing abdominal operations was 37% (69/186), significantly higher than the unadjusted mortality rate of 16.4% (1833/11192) for all patients admitted to the MICU over the same time period. Damage control procedures were performed in 65 patients (34.9%), with 46.2% mortality in this group. The most common procedures were bowel resections, which had a postoperative mortality of 44.4% (32/72) and procedures for severe clostridium difficile infection, mortality rate of 34.8% (8/23). The highest mortality procedures were those relating to feeding tube complications and decompressive laparotomies, though these were performed in a small number of patients. Twenty-seven patients met our definition of surgical rescue, requiring operative intervention for complications of prior procedures. The majority of surgical rescue patients (19/27, 70.4%) had undergone procedures at an outside facility. Mortality in the surgical rescue population was 48%. Twenty-six patients had abdominal pathology amenable to surgical intervention but did not undergo surgery, with a mortality of 100%.

	All patients	Abdominal Operations
	n = 911	n = 186
Age	57.7 +/- 16.5	59.6 +/- 15.2
Male Gender	478 (52.5%)	99 (53.2%)
Hospital Length of Stay (Days)	24.9	25.7
ICU Length of Stay (Days)	16.8	16.2
Ventilator Days	17.7	13.3
Admission via the ED	382 (41.9%)	64 (34.4%)
Discharge to Home	228 (25.0%)	34 (18.3%)
Mortality		
Admission	242 (26.6%)	69 (37.1%)
30 day	224 (24.6%)	61 (32.8%)
1 year	408 (44.8%)	93 (50%)

Conclusions: Twenty percent of EGS consults from the MICU had an abdominal process requiring an operative intervention. This patient population has significant comorbidities with a low tolerance for intraabdominal processes, resulting in high mortality. Surgical rescue is particularly challenging for patients with prior procedural complications. While the MICU population as a whole has a high baseline mortality, patients requiring abdominal surgical intervention are at an even higher risk.

	Cases (n)	Postoperative Mortality n , (%)	Damage Control Procedures n , (%)
Appendectomy	4	0 (0%)	0 (0%)
Bowel Resection	72	32 (44.4%)	47 (65.3%)
Cholecystectomy	9	1 (11.1%)	0 (0%)
Clostridium Difficile Procedure	23	8 (34.8%)	2 (8.7%)
Decompressive Laparotomy	4	3 (75%)	4 (100%)
Feeding Tube Complications	5	4 (80%)	1 (20%)
Ulcer Disease	11	2 (18.2%)	2 (18.2%)
Intraoperative Determination of Futility	4	4 (100%)	0 (0%)
Negative Procedure	21	5 (23.8%)	2 (9.5%)
Other	33	10 (30.3%)	7 (21.2%)
Total	186	69 (37.1%)	65 (34.9%)

NOTES

Session XXIII: Papers 58-65
Paper 59: 2:40-3:00 pm

ULTRASONGRAPHIC IVC DIAMETER RESPONSE AFTER ONE HOUR OF TRAUMA RESUSCITATION PREDICTS 24 HOUR FLUID REQUIREMENT

Jay Doucet* MD, Paula Ferrada* MD, Ram Nirula* MD,MPH, Sarah Murthi* MD, Jinfeng Han BSN, Andrew Singleton MD, Katie Birkas M.Sc., Daniel Haase MD, Sara Edwards MD, Giovanna Casola MD, Raul Coimbra* MD,Ph.D., AAST
Multi-Institutional Trials Committee

Invited Discussant: Grace Rozycki, MD, MBA

Introduction: Identification of occult hypovolemia in trauma patients at admission can be difficult without additional laboratory evaluation or advanced imaging. We hypothesized that in acute trauma patients, the response of ultrasound-measured inferior vena cava diameter (IVCd) or mean internal jugular diameter (IJd) in repeated eFAST examinations (USA-IVC) during standard-of-care intravenous fluid resuscitation would predict 24 hour resuscitation intravenous fluid requirements.

Methods: An interim analysis of the NTI / AAST-MITC group prospective, multi-institutional IVC-FAST cohort trial was conducted at 4 Level I Trauma Centers. Major trauma patients were screened in the supine position for an IVCd of 12 mm or less on the initial FAST examination for enrollment. A second IVCd was obtained 40-60 minutes later, after the patient received standard-of-care fluid resuscitation. Patients whose second measurement IVCd remained less than 10mm were deemed Non-Responders (NON-RESP), those at or greater than 10mm were Responders (RESP). Prehospital fluid, initial resuscitation fluid and 24 hour fluid requirements were recorded. Demographics, ISS, arterial blood gasses, ICU admission, length-of-stay, interventions and complications were recorded. Means were compared by ANOVA and categorical variables were compared via Chi-square. Receiver-operator characteristic (ROC) curves were used to compare the FAST-IVC test to Base Excess (BE), ISS and other fluid volume predictors.

Results: There were 4798 patients screened by FAST-IVC, 378 were identified with admission IVCd < 12mm, 127 were enrolled and had useable imagery. There were 80 RESP and 47 NON-RESP. Table 1 shows the univariate analysis. NON-RESP needed significantly more fluid at 24 hours. ROC analysis indicates IVCd (AUC= 0.63, C.I.: 0.51-0.74, p=0.037) but not IJd (AUC= 0.42, C.I.: 0.24-0.60, p=N.S.) was comparable to ISS (AUC=0.75, C.I.:0.60-0.90, p=0.002) in predicting 24 hour fluid requirement.

Table 1: Results	**RESP (n=80)**	**NON-RESP (n=47)**	***p* value**
Age (yrs)	51.9 ± 24	57.9 ± 22	N.S.
Gender (% Male)	58% M	69% M	N.S.
ISS	8.4 ± 7.4	11.9 ± 8.6	p=0.045
Base Excess	-0.09 ± 3.2	-1.12 ± 5.1	N.S.
Admission Sys BP (mmHg)	136 ± 18	133 ± 25	N.S.
Prehospital IV Fluids (ml)	95 ± 227	80 ± 242	N.S.
Initial Resus Fluids (ml)	433 ± 519	410 ± 466	N.S.
Post-resus min IVCd (mm)	12.45 ± 5.7	6.19 ± 2.9	p< 0.0001
Post-resus mean min IJd (mm)	7.6 ± 3.9	5.4 ± 3.5	N.S.
24-hour Fluids (ml)	1640 ± 922	2604 ± 1187	p= 0.046
Mortality	1/80	1/47	N.S.

Conclusion: eFAST ultrasound IVC diameter, but not IJ diameter response to initial trauma resuscitation is useful in predicting 24 hour fluid resuscitation requirements.

NOTES

Session XXIII: Papers 58-65
Paper 60: 3:00-3:20 pm

VENTILATOR ASSOCIATED EVENT, NOT VENTILATOR ASSOCIATED PNEUMONIA, IS A TRUE QUALITY INDICATOR

Ashley D. Meagher MD,MPH, Margaret Lind MS, Lara Senekjian MD, MS, Chinenye Iwuchukwu MD,MPH, John B. Lynch MD,MPH, Joseph Cuschieri* MD, Bryce R. Robinsom* MD, MS University of Washington

Invited Discussant: Martin Croce, MD

Introduction: Ventilator associated pneumonia (VAP) is an unreliable and inconsistent quality indicator for trauma patients that require mechanical ventilation (MV) for greater than 48 hours. In an effort to reduce variability and subjectivity of ventilator-associated conditions, the Centers for Disease Control and National Health Safety Network defined criteria for ventilator-associated events (VAE), which include the qualitative components of VAP. The aim of this study is to identify the incidence of VAE in our trauma population and the impact on outcome, compared to the traditional definition of VAP.

Methods: We retrospectively reviewed all trauma patients admitted to our trauma center between 2011 and 2017 that required at least 4 days of MV, excluding those with AIS head >4. This data was matched to our institutional physician adjudicated and culture confirmed VAP and VAE database. The primary outcome was in-hospital mortality, with discharge home and hospital length of stay as the secondary outcomes. We used Cox proportional hazard models with time-varying exposure to estimate the associations between VAE and VAP and in-hospital mortality, duration of MV, and discharge home.

Results: 1,753 trauma patients met criteria; 12% (n=221) of these developed a VAE, 7% (n=117) developed a VAP, and 4% (n=73) had both. Baseline characteristics were not different between those with VAE, VAP or both. After adjusted analyses, patients with VAE had statistically significantly higher likelihood of death, longer MV, and were less likely to discharge home (Table 1). Patients with VAP had no statistically significant likelihood of death, but were more likely to require MV, and less likely to discharge home. The probability of developing a VAP was 6%, developing a VAE was 15%, and developing both VAE and VAP was 7%.

Conclusions: Critically injured trauma patients develop VAE at double the rate of VAP. Compared to those with VAP alone, those who develop VAE are more likely to die and utilize more MV. VAE is a quality measure with objective criteria that should be utilized in trauma critical care units. Efforts should be made to identify risk factors for VAE as these patients are at high risk for poor outcomes.

Table 1: Cox Proportional Hazard Analysis by Diagnosis Type

	Death		Discharge Home		Vent-free Days	
	HR	95% CI; p-value	HR	95% CI; p-value	HR	95% CI; p-value
VAP	1.070	0.67 - 1.74; 0.78	0.44	0.31-0.62; <0.001	-8.11	-7.01 to -9.22; <0.001
VAE	1.91	1.31-2.79; 0.001	0.49	0.35-0.68; <0.001	-9.98	-8.99 to -10.98; <0.001

* Adjusted for race/ethnicity, age, weight, height, ISS, GCS motor, and mechanism of injury

NOTES

Session XXIII: Papers 58-65
Paper 61: 3:20-3:40 pm

TRAUMA ICU PREVALENCE PROJECT (TRIPP: THE PHENOTYPE OF A TRAUMA ICU. AN AAST MULTI-INSTITUTIONAL STUDY

Christopher P. Michetti* MD, Samir Fakhry* MD, Karen Brasel* MD, Niels Martin* MD, Erik Teicher MD, Anna Newcomb Ph.D., Inova Fairfax Hospital

Invited Discussant: Bryce Robinson, MD, MSc

Introduction: Specialized trauma ICU (TICU) care has considerable impact on patient outcomes. Few studies describe where and how TICU care is delivered. We hypothesized that assessment of TICU structure and function would uncover strengths, disparities and opportunities to improve surgical critical care delivery in TICUs.

Methods: This was a 1-day, multicenter prevalence study (11/2/17). Participants supplied information about their trauma centers, staff, clinical protocols, and study TICU (ICU where majority of critical trauma patients were admitted).

Results: 27 Level I and 3 Level II trauma centers from across the U.S. participated; 21(70%) had <750 beds and treated 1000-3000 trauma activations/year. Median # of hospital ICU beds was 102. Half were "closed" ICUs and 23 (76%) required an intensivist consult. Ten (33%) ICUs were classified as trauma (>80% of patients were trauma), 15 (50%) surgical/trauma, and 5 (16%) medical-surgical. Intensivists were present 24 hours/ day in 25 (83%). Centers reported a median of 8 [IQR 6.25–10] full-time trauma surgeons and 10 [7-12.75] intensivists. Trauma surgeons' ICU duties comprised 25% of their clinical time and 20% of their overall work time. 97% of ICUs conducted hand hygiene surveillance, 80% used a daily patient care checklist, 86% included families in rounds, 43% had triggers for goals of care discussions, 13% had routine therapist-family meetings, 36% had organized support activities after discharge, and 13% participated in the American Trauma Society's Trauma Survivors Network. Protocol use is listed in the Table.

% Using	Type of Protocol
≥ 90%	Brain death declaration; VTE prophylaxis; stress ulcer prophylaxis; spontaneous breathing trials; massive transfusion; traumatic brain injury (TBI) management
71-90%	Awakening trials; organ donor screening; weight-based VTE prophylaxis; Foley removal; spine clearance; blunt cervical vascular injury (BCVI) workup; red cell transfusion; VTE prophylaxis in TBI patients; ARDS ventilator management
51-70%	VAP diagnosis & antibiotic choice/duration; ventilator management; sedation/analgesia; delirium; patient mobility; treatment of BCVI; novel oral anticoagulant reversal; cuff leak test; Foley insertion; antibiotics for surgical infections
31-50%	Sleep; timing of tracheostomy; fever management/workup; ketamine for non-procedural sedation
≤ 30%	Steroids for airway edema; tranexamic acid for major ortho surgery; triggers for palliative care consult; open abdomen; procalcitonin in VAP or abdominal infections

Conclusion: A survey of structure and function of Trauma ICUs at a sample of high level trauma centers revealed significant variation including care delivery models and protocol use suggesting that opportunities may exist to improve care through sharing of best practices.

NOTES

Session XXIII: Papers 58-65
Paper 62: 3:40-4:00 pm

Twenty-four hour versus Extended Antibiotic Administration After Surgery in Complicated Appendicitis: A Randomized Controlled Trial

Sten Saar MD, Vladislav Mihnovitš BS, Thomas Lustenberger MD, Mariliis Rauk MD, Vappu Zobel MD, Erast-Henri Noor MD, Edgar Lipping MD, Andrus Lomp BS, Karl-Gunnar Isand MD, Urmas Lepner MD,Ph.D., Peep Talving* MD,Ph.D., University Of Tartu

Invited Discussant: Robert Sawyer, MD

Introduction: A recent prospective investigation suggested that a three-days antibiotic administration was non-inferior to a five-day therapy following appendectomy for complicated appendicitis [1]. Another retrospective investigation noted that 24-hour antibacterial therapy was non-inferior to extended administration [2]. We set out to investigate noninferiority of 24-hour therapy to extended treatment after appendectomy in complicated appendicitis in a pilot randomized controlled trial.

Methods: After IRB approval, all consecutive adult patients with complicated appendicitis (gangrenous, perforated appendicitis, and periappendicular abscess) subjected to appendectomy between 5/2016 and 12/2017 were randomly assigned to antibacterial therapy limited to 24 hours vs. >24 hours (extended administration) after appendectomy. Relevant exclusion criteria were applied. 30-day follow-up was available for all patients. Primary outcomes included post-operative complications and Comprehensive Complication Index (CCI). Secondary outcome was hospital length of stay (HLOS).

Results: A total of 70 patients were enrolled with 34 and 36 cases in the 24-hour and the extended-therapy group, respectively. Demographic profile was similar between the study groups. Laparoscopic appendectomy was performed in 88.2% and 94.4% of patients in the 24-hour and extended group, respectively (p=0.42). Overall rate of complications was 20.6% and 30.6% in the 24-hour and extended group, respectively (OR 1.70; 95% CI 0.57-5.06; p=0.34). Mean CCI did not differ between the study groups (p=0.53). HLOS was significantly reduced in the 24-hour group (61.3 ± 35.7 vs. 81.4 ± 39.6 hours, p=0.03).

Conclusion: In the current prospective randomized investigation, 24-hour post-appendectomy antibiotic administration did not result in a worse primary outcome. However, the 24-hour antibacterial administration resulted in a significant reduction in HLOS with a major cost saving perspective.

References:

1. van Rossem CC et al. Antibiotic Duration After Laparoscopic Appendectomy for Acute Complicated Appendicitis. JAMA Surg. 2015;18:1-7.

2. Kimbrell AR et al. Do postoperative antibiotics prevent abscess formation in complicated appendicitis? Am Surg. 2014;80(9):878-83.

NOTES

Session XXIII: Papers 58-65
Paper 63: 4:00-4:20 pm

P-SELECTIN IS CRITICAL FOR DE NOVO PULMONARY ARTERIAL THROMBOSIS FOLLOWING BLUNT THORACIC TRAUMA

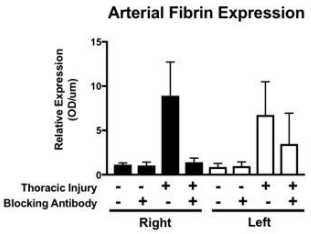
Linda M. Schutzman MD, Ian E. Brown MD,Ph.D., Robert R. Rigor Ph.D., Nasim Khosravi MD, Karen Chung BS, Joseph M. Galante* MD, University of California, Davis

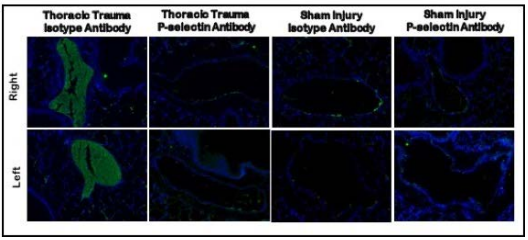
Invited Discussant: Alicia Mohr, MD

Introduction: Thromboembolic events within the pulmonary arterial vasculature are a particularly troublesome complication of severe blunt thoracic trauma. Mechanisms underlying these events are currently in question as pulmonary thromboembolic events in this population tend to be diagnosed more rapidly, more frequently and without an associated systemic thrombosis. This study investigates the role of P-selectin in thrombus formation through the use of in vivo blocking antibodies. We hypothesize that activation of the endothelium and increased P-selectin expression is necessary for *de novo* pulmonary arterial thrombosis in the setting of blunt thoracic trauma.

Methods: A murine weight-drop model of right lateral blunt thoracic trauma was used. Wild-type mice in the experimental group were given blocking antibodies against P-selectin prior to the trauma. All mice were euthanized at 24 hours for evaluation with hematoxylin-eosin staining or immunofluorescent staining for CD41, fibrin and P-selectin.

Results: Injured mice that did not receive the P-selectin antibody had a 7 fold greater fibrin accumulation (fluorescence per um of arterial wall) in comparison to uninjured sham mice. Injured mice that did receive the P-selectin antibody had less than a 2 fold increase than sham controls. Right and left lobes were compared to identify potential differences due to direct versus indirect lung injury. Equal increases in mean fibrin expression were noted on the coup side of injury and the countercoup side. No difference in mean fibrin deposition was found between sham controls that received the P-selectin blocking antibody and those that received an isotype control antibody.





Conclusion:The use of blocking antibodies demonstrates a critical role for P-selectin in early eccentric fibrin accumulation at the intraluminal surface of pulmonary arteries following blunt thoracic trauma.

NOTES

Session XXIII: Papers 58-65
Paper 64: 4:20-4:40 pm

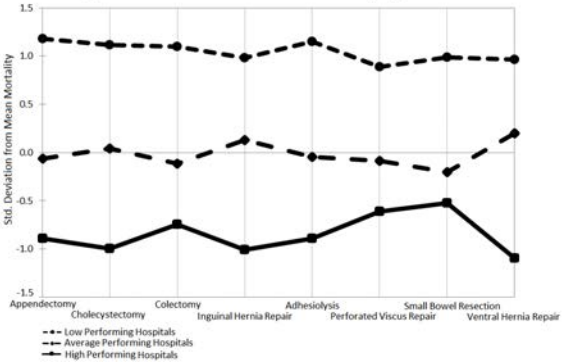
HIGH PERFORMANCE EMERGENCY GENERAL SURGERY HOSPITALS: GOOD AT ONE OPERATION, GOOD AT THEM ALL

Michael P. DeWane MD, Nitin Sukumar MS, Marilyn J. Stolar Ph.D., Thomas M. Gill MD, Adrian A. Maung* MD, Kevin M. Schuster* MD,MPH, Kimberly A. Davis* MBA,MD, Robert D. Becher MD, MS Yale School of Medicine

Invited Discussant: Avery Nathens, MD, PhD, MPH

Introduction: There is a longstanding interest in the field of management science to study high performance organizations. Applied to medicine, research on hospital performance indicates that some hospitals are high performing, while others are not. The objective of this study was to identify a cluster of high performing emergency general surgery (EGS) hospitals, and assess whether high performance at one EGS operation was associated with high performance on all EGS operations.
Methods: Adult patients who underwent 1 of 8 EGS operations were identified in the California State Inpatient Database (2010-2011), which we linked to the American Hospital Association database. Beta regression was used to estimate a hospital's risk-adjusted mortality, accounting for patient- and hospital-level factors. Cluster analysis grouped hospitals by pattern of mortality rates across the 8 EGS operations using z-scores. Logistic regression compared hospital characteristics by cluster.
Results: A total of 220 acute care hospitals were included. Three distinct clusters of hospitals (Figure 1) were defined based on assessment of mortality for each operation type: high performing hospitals (n=66), average performing (n=99), and low performing (n=55). The mortality by individual operation type (x-axis in Figure 1) at the high performing cluster was consistently 2 standard deviations better than the low performing cluster ($p<0.001$). Within-cluster variation was minimal at high performing hospitals compared to wide variation at low performing hospitals. A hospital's high performance in one EGS operation type predicted high performance on all EGS operation types.

Figure I. Cluster Peformance Stratified by Operation



Conclusion: High performing EGS hospitals attain excellence across all types of EGS operations, with minimal variability in mortality. Poor performing hospitals are persistently below average, even for low-risk operations. These findings suggest that top-performing EGS hospitals are highly reliable, with systems of care in place to achieve outstanding results. Further investigation and collaboration is needed to identify factors associated with high performance.

NOTES

Session XXIII: Papers 58-65
Paper 65: 4:40-5:00 pm

THE EGS GRADING SCALE FOR SKIN AND SOFT TISSUE INFECTIONS IS PREDICTIVE OF POOR OUTCOMES : AN AAST MULTI-CENTER VALIDATION STUDY

Stephanie Savage* MD, MS, Garth H. Utter* MD, MSc, Salina M. Wydo MD, Babak Sarani* MD, Therese M. Duane* MBA,MD, Patrick B. Murphy MD,MPH, Martin D. Zielinski* MD, Josh Tierney MD, Thomas J. Schroeppel* MD, MS, Leslie Kobayashi* MD, Kevin Schuster* MD,MPH, Lava Timsina MPH,Ph.D., Marie Crandall* MD,MPH, Indiana University School Of Medicine

Invited Discussant: Eileen Bulger, MD

Introduction: Over the last five years, the American Association for the Surgery of Trauma (AAST) has developed grading scales for Emergency General Surgery (EGS) conditions. An initial validation study was published in 2015, using diverticulitis as a conceptual framework. Though the grading scale was predictive of complications and length of stay, there was no association with mortality. As the EGS grading scales encompass a diverse group of conditions, the purpose of this study was to validate the grading scale concept against a different disease process with a higher associated mortality. We hypothesized that the grading scale would be predictive of complications, length of stay and mortality in skin and soft tissue infections (STI), including necrotizing infections (NSTI).

Methods: This multi-institutional trial encompassed 12 centers. Weighted sampling was used to ensure roughly balanced representation of disease severity. 100 patients were identified from each center and data collection included demographics, disease characteristics and outcomes such as mortality, overall complications, hospital and ICU length of stay. The EGS scale for STI was used to grade each patient and two surgeons provided grades to evaluate inter- rater reliability. Pearson's chi-squares, simple and multiple logistic regressions and ANOVA were used as appropriate. Estimates with 95% confidence intervals were reported and inter-rater reliability was assessed.

Table 1. Complications by EGS grade for skin and soft tissue infections.

	Complications	Length of Stay	ICU Days	Mortality
	Odds Ratio (95% Confidence Interval)			
Grade I (n=312)	ref	ref	ref	ref
Grade II (n = 117)	1.38 (0.68, 2.53)	1.47 (1.34, 1.62)	2.78 (2.06, 3.75)	5.34 (1.21, 23.50)
Grade III (n = 287)	0.79 (0.44, 1.41)	1.33 (1.23, 1.43)	1.64 (1.23, 2.19)	0.66 (0.07, 6.38)
Grade IV (n = 181)	2.13 (1.22, 3.71)	2.89 (2.69, 3.10)	7.98 (6.32, 10.09)	2.65 (0.61, 11.43)
Grade V (n = 243)	2.41 (1.42, 4.08)	3.40 (3.18, 3.63)	9.78 (7.77, 12.31)	15.18 (3.24, 71.12)

Results: 1170 patients were included in this study. Inter-rater reliability was moderate (kappa coefficient 0.472-0.642, with 64-76% agreement). Higher grades (IV and V) corresponded to significantly higher LRINEC scores when compared with lower EGS grades (LRINEC scores : Grade 1 2.55 (SD 2.3), Grade II 2.89 (SD 2.1), Grade III 2.91 (SD 2.3), Grade IV 4.40 (SD 2.4), Grade V 4.72 (SD 2.7), $p < 0.0001$). Patients with grade IV and V STI had significantly increased odds of all complications, as well as ICU and overall length of stay. These associations remained significant in logistic regression controlling for age, gender, comorbidities, mental status and hospital-level volume. Grade V disease was significantly associated with mortality as well (Table 1).

Conclusion: This second validation effort demonstrates continued moderate inter-rater reliability. Grade IV and V STI are significantly predictive of complications, hospital length of stay and Grade V disease was predictive of mortality. Though predictive ability does not improve linearly with STI grade, this is reflective of a relatively dichotomous disease process, in which cellulitis and abscess are milder disease processes and invasive infections are highly morbid. This second validation study confirms the EGS grading scale as predictive, and reproducible, in disparate disease processes.

NOTES

AAST Annual Business Meeting
(Members Only)
Friday, September 28, 2018 5:00 PM-6:30 PM
Location: Seaport A-C, Second Level (Seaport Tower)

AAST Reception and Banquet
Friday, September 28, 2018, 7:30 PM- 11:00 PM
Location: Seaport Foyer &
Seaport D-H, Second Level (Seaport Tower)

PETER C. CANIZARO, M.D.

June 30, 1935 - September 3, 1990

Peter C. Canizaro was born on June 20, 1935, in Vicksburg, Mississippi. He received his B.A. degree from the University of Texas, Austin, in 1956 and his M.D. degree from the University of Texas Southwestern Medical School, Dallas, in 1960. Following an internship at Parkland Memorial Hospital/UTSMS, he spent two years as a Captain in the Surgical Research Unit, Brooke Army Hospital, Fort Sam Houston. Following another year as a NIH Research Fellow, he completed his surgical residency at Parkland/UTSMS from 1964-1968. He remained on staff at Parkland/UTSMS from 1968-1974, and then subsequently served on the faculty at the University of Washington (1974-1976) and Cornell University Medical Center (1976-1981) where he became Professor of Surgery. Dr. Canizaro became Professor and Chairman of the Department of Surgery at the Texas Tech University Health Sciences Center in 1982 and remained there until his untimely death in 1990. Dr. Canizaro was an innovative surgical scientist who made multiple contributions to the field of trauma and resuscitation. Examples of topics covered in his published manuscripts include the following:

1960	Distribution changes in extraceullular fluid during acute hemorrhage (with G. Tom Shires, M.D.)
1963	Use of dextran
1963	Use of hypertonic glucose
1969	Diagnostic abdominal paracentesis in trauma
1970	Fluid resuscitation of hemorrhagic shock
1971	Use of Ringer's lactate during shock
1974	Oxygen-hemoglobin dissociation curve
1975	Stroma-free hemoglobin
1985	Ultrasound detection of fluid collection
1986	Endopeptidase in human lung

In recognition of Dr. Peter Canizaro's outstanding contributions to the science of trauma, the AAST has presented the Canizaro Award since 1993 to the best paper by a new member in their first two years of membership.

PETER C. CANIZARO AWARD

1993	Philip S. Barie, M.D., M.B.A.
1994	Frederick A. Luchette, M.D.
1995	Patrick J. Offner, M.D.
1996	Rodney M. Durham, M.D.
1997	Ronald J. Simon, M.D.
1998	Charles N. Mock, M.D.
1999	David A. Spain, M.D.
2000	John T. Owings, M.D.
2001	Hans-Christoph Pape, M.D.
2002	Karen J. Brasel, M.D., M.P.H.
2003	James Jeng, M.D.
2004	Eileen M. Bulger, M.D
2005	Carnell Cooper, M.D.
2006	Saman Arbabi, M.D.
2007	Kari Hansen, M.D.
2008	Randall S. Friese, M.D.
2009	Andrew C. Bernard, M.D.
2010	Oscar D. Guillamondegui, M.D., M.P.H
2011	Jay Manaker, M.D., FACEP
2012	Stephanie Savage, M.D.
2013	Jason Smith, M.D.
2014	Sarah Majercik, M.D.
2015	Matthew B. Bloom, M.D.
2016	Jon Simmons, M.D.
2017	Scott Brakenridge, M.D.

Session XXV: Plenary Session - #66-68

Saturday, September 29, 2018, 8:00 AM-9:00 AM

Location: Seaport A-C, Second Level (Seaport Tower)

Moderator: Eric Toschlog, MD

Recorder: Thomas Esposito, MD, MPH

Session XXV: Papers 66-68: Plenary Paper
66: 8:00-8:20 am

RESIILIENCE AND LONG-TERM OUTCOMES AFTER TRAUMA: AN OPPORTUNITY FOR EARLY INTERVENTION?

Deepika Nehra MD, Juan P. Herrera-Escobar MD, Syeda S. Al Rafai MD, Joaquim Havens* MD, Reza Askari* MD, Stephanie Nitzschke MD, George Velmahos* MD, George Kasotakis MD, Karen J. Brasel* MD, Nomi Levy-Carrick MD, M.Phil, Ali Salim* MD, Adil Haider* MD,MPH, Brigham and Womens Hospital

Invited Discussant: Ben Zarzaur, MD

Introduction: Resilience, or the ability to cope with difficulties, influences an individual's response to life events including unexpected injury. There are early life experiences and biological variables that impact an individual's response to adversity, but research has demonstrated that resilience can be cultivated across the lifespan despite adversity. We sought to assess the relationship between patient self-reported resilience traits and functional and psychosocial outcomes six months after injury.

Methods: Adult trauma patients 18-65 years of age with moderate to severe injuries (ISS ≥9) admitted to one of three Level I Trauma Centers between 2015-2017 were contacted by phone at 6 months post-injury and asked to complete a validated Trauma Quality of Life (T-QoL) survey and PTSD screen. The T-QoL survey assesses emotional and physical well-being at the time of interview, in addition to recovery and resilience. Patients were asked three questions to assess their resilience and the 5-point Likert scale answers were used to classify the patients into "low" or "high" resilience categories (Table 1). Long-term outcomes including functional limitations with activities of daily living, return to work, chronic pain and the incidence of PTSD were compared between groups. Adjusted logistic regression models were built to determine the association between resilience and each of the long-term outcomes.

Table 1: Resilience questions and scoring system

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Q1. I have been able to make changes to handle my current limitations		+0		+1	
Q2. I am more positive about my future than I was before the injury		+0		+1	
Q3. Even though I was injured, my life is better now than it was before the injury		+0		+1	
MIN SCORE = 0; MAX SCORE = 3	**COMPOSITE SCORE 0-1 = LOW RESILIENCE**			**COMPOSITE SCORE 2-3 = HIGH RESILIENCE**	

Results: A total of 222 patients completed the 6-month interview. 149/222 of the patients (67%) were classified in the low resilience group. Mean age was 41±14 years with 65% being male and 91% suffering a blunt traumatic injury. Average ISS was 15.5 ± 8.2 and 41% required ICU admission. Demographic and clinical characteristics were not significantly different between the low and high resilience groups. After adjusting for potential confounders we found that patients in the low resilience group had significantly higher odds of functional limitations in activities of daily living. In addition, patients in the lower resilience group were less likely to have returned to work/school, more likely to report chronic pain and more likely to screen positive for PTSD (Table 2).

Table 2: Long-term outcomes for low vs. high resilience groups

	Adjusted Odds Ratio (95% CI) of outcome compared to high resilience group
Functional limitation in activities of daily living	4.27 (1.94-9.40)
Not yet returned to work/school	2.71 (1.25-5.91)
Chronic pain	3.00 (1.43-6.29)
Positive screen for PTSD	1.89 (1.04-3.45)

*Adjusted for: age, sex, education, injury type, ISS, ICU stay, head injury, previous psychiatric diagnosis

Conclusion: Patients with low resilience demonstrated worse functional and psychosocial outcomes six months after injury. These data suggest that screening for resilience and developing and deploying early interventions to improve resilience-associated traits as soon as possible after injury may hold promise for improving important long-term functional outcomes.

NOTES

Session XXV: Papers 66-68: Plenary
Paper 67: 8:20-8:40 am

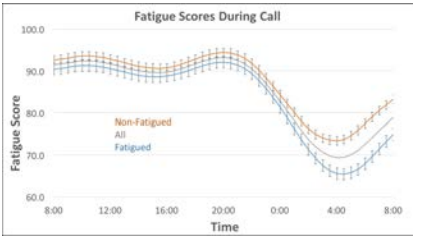
CORRELATION OF ON-CALL TRAUMA SURGEON FATIGUE FLUCTUATIONS WITH BURNOUT RISK AND SURGICAL SKILL PERFORMANCE

Brittany Lisjak PA-C, Irina Catanescu DO, Matthew L. Moorman MD, FACS, M. S. O'Mara* MBA,MD, FACS, M. C. Spalding DO,Ph.D., Ohio Health Grant Medical Center

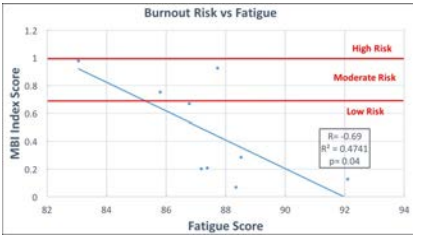
Invited Discussant: Heena Santry, MD

Introduction: Effects of fatigue are thought to be prevalent in the surgical profession, yet descriptive metrics on fatigue are limited. We aimed to quantify trauma surgeon fatigue while on 24-hour call, correlating to surgical task performance and burnout risk. We hypothesize that fatigue levels differ significantly throughout call shifts and worse average fatigue is associated with higher burnout risk and decreased surgical task performance.

Methods: This was a 33 day, prospective, 9 trauma surgeon study at a Level I trauma center. Call shifts were 24 hours. Fatigue was quantified for all subjects from actigraphy monitors utilizing a validated alertness model. Surgeons with scores <70 sustained for >/= 10% total shift time were labeled the "fatigued" group. A laparoscopic peg transfer task was performed, recorded pre/post call and scored based on accuracy. At the end of the trial period each surgeon completed a Maslach Burnout Inventory (MBI) to quantify risk of burnout. Fatigue fluctuations were correlated with time of day, reported work hours, sleep metrics, task performance, and MBI scores. Variables were compared between the "fatigued" and "non-fatigued" groups.



Results: Post call fatigue levels were significantly worse (80.8 vs 90.7, $p<0.001$), more laparoscopic task errors were made ($p=0.05$), and overall task performance decreased ($p=0.05$) compared to pre-call levels. The "fatigued" group had shorter on-call sleep durations (160 vs 286 min; $p = 0.007$) and fatigued at a higher velocity ($p=0.02$) when compared to "non-fatigued" counterparts. Finally, a strong correlation existed between increased MBI burnout risk score and worsened surgeon fatigue ($r = -0.69$, $p = 0.04$). For every one-point worse in fatigue score a surgeon had a 3.5x likelihood of increased risk of burnout. There was no significant difference between groups in regards to hours worked or sleep obtained three days prior to call.



Conclusion: Trauma surgeons experience a significant increase in fatigue during a 24-hour call shift, average level of surgeon fatigue is highly correlated with self-assessment of burnout risk, and a trauma surgeon's ability to perform a surgical task is significantly worse after a 24-hour call shift. Future studies can expand this investigational work to better understand the impact of trauma surgeon fatigue.

NOTES

Session XXV: Papers 66-68: Plenary
Paper 68: 8:40-9:00 am

STOP FLAILING: THE IMPACT OF BICORTICALLY DISPLACED RIB FRACTURES ON PULMONARY OUTCOMES IN PATIENTS WITH CHEST TRAUMA - AN AAST MITC STUDY

Lara Senekjian MD, MSCI, Yekaterina Birkas BS, MBS, Milos Buhavac MBBS, Saraswati Dayal MD, Sean Pierce MD, Jason Sperry* MD,MPH, Graciella Bauza MD, Evert A. Eriksson* MD, Stuart Leon MD, Rachel Nygaard MD, Anthony Kopatsis MD, Mario P. Marquez MD, Tammy Kopelman* MD, Forrest O. Moore* MD, Ram Nirula* MD,MPH, University of Utah

Invited Discussant: Fredric Pieracci, MD, MPH

Introduction: Most studies examining outcomes related to thoracic trauma focus on the presence or absence of flail chest, pulmonary contusion, hemothorax or pneumothorax with little attention paid to bicortically displaced rib fractures. An association between bicortical fractures and pulmonary outcomes such as pneumonia, ARDS and the need for tracheostomy would influence care decisions. We therefore tested the hypothesis that bicortical rib fractures were an important clinical marker for pulmonary outcomes in **non-flail** chest trauma patients.

Methods: This AAST-MITC retrospective study analyzed bluntly injured adults with at least 2 rib fractures collected from 9 US level I and II trauma centers from 2011 to 2016. Each chest CT was independently reviewed and the location and severity of rib fractures and pulmonary contusions were categorized. Univariate and multivariate logistic regression analyses were performed to identify independent predictors of pneumonia, ARDS and tracheostomy. Analyses were performed in non-flail patients as well as controlling for flail chest to determine if bicortical fractures were independently associated with pulmonary outcomes.

Results: Of the 1110 patients 103 (9.3%) developed pneumonia, 78 (7.0%) required tracheostomy, and 30 (2.7%) developed ARDS. Bicortical fractures were present in 277 (25%) of all patients and in 206 (20.3%) of patients without flail chest. After adjusting for patient demographics, injury and admission physiology, negative pulmonary outcomes occurred more than twice as frequently in those with bicortical displacement **without** flail chest - pneumonia (OR 2.01, 95% CI 1.1, 3.6), ARDS (OR 2.62, 95% CI 1.01, 6.82) and tracheostomy (OR 2.7, 95% CI 1.4, 5.2). Even when adjusting for the presence of flail chest, bicortical displacement remained an independent predictor of pneumonia, tracheostomy and ARDS.

Conclusion: Given that bicortical displacement can be difficult to identify on plain radiography and its association with negative pulmonary outcomes, even in the **absence** of flail chest, chest CT should be employed in the evaluation of rib fractures. Future studies should investigate the utility of flail chest management algorithms such as epidural and surgical stabilization on pulmonary outcomes in patients with bicortical displacement.

NOTES

Session XXVII: Quickshot Session I - #1-13

Saturday September 29, 2018, 9:00 AM-10:18 AM

Location: Seaport A-C, Second Level (Seaport Tower)

Moderator: Roxie Albrecht, MD

Session XXVI: Quickshot I - 1- 13
Paper 1: 9:00-9:06 am

THE ACA AND EMERGENCY GENERAL SURGERY CHOLECYSTECTOMIES

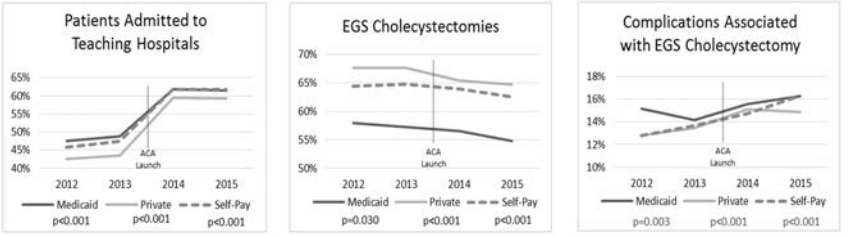
Laura N. Godat* MD, Todd W. Costantini* MD, Jay Doucet* MD, University of California, San Diego

Invited Discussant: Lance Stuke, MD, MPH

Introduction: Gallbladder disease is a common reason for visits to the emergency department and frequently results in emergency general surgery (EGS). The Affordable Care Act (ACA) was landmark legislation enacted in 2014 mandating health insurance coverage for all. The ACA sought to improve access to care and decrease morbidity, mortality and costs. We hypothesize that the ACA shifted EGS to teaching institutions, and that the number of EGS cholecystectomies decreased as access to care improved.

Methods: This is a retrospective review using the National Inpatient Sample Database from 2014 through quarter 3 of 2015. Patients age 18-64 who were admitted through the emergency department with a diagnosis of gallbladder disease were identified by ICD-9 codes. Patient demographics, payer type (Medicaid, Private or Self-pay), Charlson Comorbidity Index (CCI), hospital and regional characteristics and were obtained. Outcomes were cholecystectomy, complications, mortality and wage index-adjusted costs. The effect of the ACA was determined by comparing the pre-ACA (2012 & 2013) years to the post-ACA years (2014 & 2015) and included univariate, bivariate and adjusted Difference-in-Differences (DID) analyses.

Results: 189,023 patients with gallbladder disease were identified. In the post-ACA period, the proportion of Self-pay admissions decreased from 19.3% to 13.6% (-5.7%, $p<0.001$) and Medicaid admissions increased from 26.3% to 34.0% (+7.7%, $p<0.001$). Private insurance admissions did not change significantly. Across all payer categories the proportion of admissions to teaching hospitals increased, the number of EGS cholecystectomies decreased, while complications increased (Figure). The portion of patients with CCI≥2 increased significantly in all payer groups (Medicaid 20.0% to 21.1%, Private 13.8% to 15.5% and Self-pay 12.1% to 13.2% all $p<0.05$). Overall mortality (pre-ACA 0.7% & post-ACA 0.8%, $p=0.066$) was unchanged within payer groups. Median costs increased significantly for Medicaid and Private insurance while Self-pay was unchanged. Based on adjusted DID analyses the number of EGS cholecystectomies decreased more rapidly for Insured compared to Self-pay patients (-2.7% vs. -1.21%, $p=0.033$) as did median cost (+$454.25 vs. +$113.60, $p=0.017$).



Conclusion: The ACA has changed EGS, shifting the majority of patients to teaching institutions despite insurance type and decreasing the need for EGS cholecystectomy. The trend towards higher complication rate with increased overall cost requires attention. A national registry for EGS will better quantify these outcomes and could direct future initiatives to improve EGS care.

NOTES

Session XXVI: Quickshot I - 1- 13
Paper 2: 9:06-9:12 am

EMERGENCY GENERAL SURGERY IN GERIATRIC PATIENTS: HOW SHOULD WE EVALUATE HOSPITAL EXPERIENCE?

Ambar Mehta MPH, Sanskriti Varma David T. Efron* MD, Bellal Joseph* MD, Nicole Lunardi MSPH, Elliott R. Haut* MD,Ph.D., Zara Cooper* MD, Joseph V. Sakran MD,MPH, MPA Johns Hopkins School of Medicine

Invited Discussant: Jody DiGiacomo, MD

Introduction: Emergency general surgery (EGS) remains a significant burden for geriatric patients in the U.S. This study determined if either hospital proportion or annual volume of geriatric patients is associated with outcomes after EGS procedures.

Methods: Using AAST criteria, we identified five EGS procedures in the 2012-2015 Nationwide Inpatient Sample in geriatric patients (65+ years old): small bowel resections, large bowel resections, peritoneal adhesiolysis, control of GI ulcer and bleeding, and laparotomy. We defined hospital volume as the absolute number of geriatric patients undergoing EGS procedures, where hospital proportion referred to the ratio of geriatric patients among all EGS procedures. To remove outliers, we excluded the top and bottom 5% of hospitals by proportion of geriatric patients. Hospitals were then divided into quartiles both by proportion and by volume of geriatric patients. Logistic regressions compared four outcomes between these quartiles: mortality, complications, failure-to-rescue (FTR, death after a complication), and extended length of stay (eLOS, procedure-specific top decile of patients). All regressions adjusted for both hospital proportion and volume of geriatric patients, confounding factors, and clustering.

Results: We identified 25,084 EGS procedures in geriatric patients at 3528 hospitals (mortality: 10.6%, complications: 30.5%, FTR: 27.7%, eLOS: 9.1%). The median hospital proportion of geriatric patients among EGS procedures was 42.8% (IQR: 33.3% to 52.2%), whereas the median hospital volume of these patients was 14/year (IQR: 8/year to 19/year). After adjustment, the lowest hospital proportion quartile relative to the highest was associated with adverse outcomes: mortality (OR 1.21 [95%-CI 1.03-1.44]), complications (OR 1.16 [1.05-1.29]), FTR (OR 1.32 [1.08-1.63]), and eLOS (OR 1.30 [1.12-1.50]). In contrast, the lowest volume quartile relative to the highest was not associated with adverse outcomes (Table). Procedure-specific analyses revealed similar findings. On sensitivity analyses, as the hospital proportion of geriatric patients increased by 10%, the odds of all adverse outcomes decreased as follows: mortality by 7%, complications by 4%, FTR by 9%, and extended LOS by 8%.

Complex EGS Procedures	Lowest quartile relative to highest (ref) Adjusted odds ratio (95%-CI)	P-value
Hospital quartiles by geriatric PROPORTION		
Mortality	1.21 (1.03-1.44)	*0.024
Complications	1.16 (1.05-1.29)	*0.004
Failure-to-rescue	1.32 (1.08-1.63)	*0.008
Extended LOS	1.30 (1.12-1.50)	*0.001
Hospital quartiles by geriatric VOLUME		
Mortality	1.08 (0.88-1.32)	0.452
Complications	1.02 (0.90-1.16)	0.709
Failure-to-rescue	1.09 (0.86-1.38)	0.490
Extended LOS	0.98 (0.82-1.17)	0.815

Regressions adjusted for both hospital proportion of and hospital volume of geriatric EGS patients, patient age, gender, race, number of comorbidities, payer, malignancy, sepsis, EGS procedure, academic institution, region, beds, and hospital clustering.

*P<0.05 depicts significance.

Conclusion: Higher hospital proportion of geriatric EGS patients, rather than hospital volume, is associated with better postoperative outcomes. These findings have potential implications for benchmarking endeavors.

NOTES

Session XXVI: Quickshot I - 1- 13
Paper 3: 9:12-9:18 am

THE ACUTE ABDOMEN: FASTER AND SAFER WITH ACUTE CARE SURGERY

David R. Jeffcoach MD, James W. Davis* MD, Alan Pang MD, Rachel Dirks Ph.D.,
UCSF Fresno

Invited Discussant: Brandon Bruns, MD

Introduction: There have been studies comparing outcomes between acute care surgery (ACS) and traditional call models (TRAD) treating common surgical problems such as acute appendicitis and acute cholecystitis. However, there is no data comparing these call models for outcomes of patients with the complex acute abdomen. We hypothesized that the ACS model would lead to more prompt care and fewer complications than the TRAD model. The purpose of this study was to compare outcomes, patient flow and cost between an ACS and TRAD model in the same community when treating the acute abdomen.

Methods: The study was performed at two different medical centers in the same hospital system; one a Level I Trauma center using an in house ACS call model, the other a community hospital using a TRAD home call model. Medical records were searched for ICD-9 codes, ICD-10 codes and CPT codes for the diagnoses of perforated viscous, incarcerated with possible strangulated hernia, and diverticulitis with peritonitis requiring emergent surgery from October 2011 through December 2017. Patients not requiring emergent surgery were excluded. ACS and TRAD models were compared using demographic data, time intervals to treatment, outcomes and cost.

Results: Over the study period, 1,465 patients had ICD-9, -10 or CPT codes meeting screening criteria and 1,195 did not require emergent surgery leaving 269 patients in the study cohort. There were 201 patients from the ACS center and 68 from the TRAD center with similar rates of perforated viscus, hernia with possible strangulation and diverticulitis requiring surgery. Time to surgeon at bedside was 46 min vs. 126 min (p<0.001) and time from consult to operating room was 231 min vs. 309 min (p=0.011) respectively. The American Society of Anesthesiologists (ASA) physical status classification score was higher in the ACS group (p=0.011). While hospital length of stay and cost were equivalent, the complication rate was significantly lower in the ACS group (27% vs. 44%; p=0.01).

	ACS	TRAD	*P-value*
Same Size (n)	201	68	
Time to Bedside (min)	46 [25-90]	126 [71-308]	<0.001
Time to OR (min)	231 [156-360]	309 [173-520]	0.01
Length of Stay (days)	7 [4-11]	7 [3-10]	0.12
Complications	55 (27%)	30 (44%)	0.01
Mortality (%)	14 (7%)	5 (7%)	0.91
Cost ($)	$15241 ± $17651	$16221 ± $24896	0.39

Conclusion: ACS was superior to TRAD when treating more complex abdominal surgical emergencies with faster time to evaluation and reduced complications rates while cost remained equivalent.

NOTES

Session XXVI: Quickshot I - 1- 13
Paper 4: 9:18-9:24 am

OUTCOMES IN ADHESIVE SMALL BOWEL OBSTRUCTION FROM A LARGE STATEWIDE DATABASE: WHAT TO EXPECT AFTER NON-OPERATIVE MANAGEMENT

Lyndsey E. Wessels MD, Casey E. Dunne MPH, Richard Y. Calvo Ph.D., Jason M. Bowie MD, William J. Butler MD, Vishal Bansal* MD, C. Beth Sise MSN, Michael J. Sise* MD, Scripps Mercy Hospital Trauma Service

Invited Discussant: Jose Diaz, MD

Introduction: Although adhesive small bowel obstruction (ASBO) is frequently managed non-operatively, little is known regarding outcomes on readmission following this approach. We used a large-scale population-based database to examine patients readmitted for ASBO who were initially managed non-operatively. We evaluated the risk factors for operative intervention and mortality at readmission.

Methods: ASBO patients were identified from the California Office of Statewide Health Planning and Development 2007-2014 discharge dataset. Patients who at primary admission were either managed operatively or had an ICD-9 code for a chronic or obstructive small bowel disease (e.g., Crohn's, hernia) were excluded. Associations between risk factors and both operative intervention and death following readmission were evaluated using backward stepwise logistic regression.

Results: Of the 18,408 ASBO patients, we identified 3,656 (19.9%) who were readmitted. Most were female (61.7%) and Caucasian (72.7%). Median age was 67 years (range 18-102). The 1,474 (40.3%) requiring operation at readmission were younger (67 vs 69, p=0.001) and presented sooner (157 vs 320 days, p<0.001). After adjustment, variables found protective against operative intervention were age ≥65 years (OR 0.84, 95%CI 0.73-0.96) and readmission after one year (OR 0.64, 95%CI 0.56-0.73). Risk of operative intervention was associated with Hispanic ethnicity (OR 1.27, 95%CI 1.06-1.50) and LOS >2 days at index admission (OR 1.41, 95%CI 1.23-1.62). Patients at greater risk for death were ≥65 years old (OR 5.12, 95%CI 2.62-10.01), were managed operatively (OR 3.93, 95%CI 2.00-7.70), and had a readmission LOS >7 days (OR 2.47, 95%CI 1.37-4.46). Being discharged home after initial non-operative management was protective against death in the adjusted multivariate model (OR 0.51, 95%CI 0.30-0.87).

Conclusion: In this large-scale study of patients readmitted for ASBO who were initially managed non-operatively, those readmitted within a year were at greater risk for operative intervention, and those who were ultimately managed operatively had a higher risk of death. Prospective research is needed to further delineate outcomes associated with initial non-operative management of ASBO.

NOTES

Session XXVI: Quickshot I - 1- 13
Paper 5: 9:24-9:30 am

EGS PRESENTS GREATER FINANCIAL RISK THAN TRAUMA

Andrew C. Bernard* MD, Michael Baker BS, Andy Kelly MS, Daniel Davenport Ph.D.,
University of Kentucky
Invited Discussant: Oliver Gunter, MD

Introduction: Trauma and emergency general surgery (EGS) are two main pillars in acute care surgery (ACS). EGS involves an older and more comorbid population and therefore be associated with greater financial risk. We sought to determine the relative profitability of trauma and EGS be analyzing cost and revenue.
Methods: Data were extracted from our healthcare data warehouse and the inpatient finance database for emergency admissions ≥ 18 years to ACS Service at our referral level 1 trauma center from 1/1/2015 to 12/31/2016. Outcomes, financial metrics, payor, case mix index (CMI) and diagnosis-related group (DRG) were collected. Uninsured patients were excluded. Complex care was defined as multiple services involved.
Results: There were 2216 EGS and 3249 trauma admissions. Trauma were more likely to be admitted to the ICU (42% vs 32%, p<.001) but length of stay (LOS), ICU LOS and mortality were the not different (Table). Complex care was more common in EGS. Trauma were more likely to have managed care insurance (p<.001). EGS had lower CMI, total cost, direct cost and indirect cost. But revenue for EGS was far lower than trauma, resulting in lower contribution margin (revenue – direct cost) and net profit (net revenue – total cost).
Conclusions: Though outcomes are similar, EGS is associated with more care complexity and narrower profit margin than trauma. Much higher revenue and net profit in trauma is likely related to payor mix. Government insurance, more common in the older EGS population, makes EGS less profitable. Cost reduction and revenue optimization strategies more even more important in EGS in order to maintain a positive margin.

Table: Differences between EGS and Trauma Admissions

Variable	EGS	Trauma	P-value
No. of Patients	**2,216**	**3,249**	
ICU admission, %	33.0%	41.6%	<0.0001
In ICU admits, ICU Days, avg. (SD)	5.6 (7.9)	5.3 (7.7)	0.4073
Complex Care, %	7.6%	4.6%	<0.0001
LOS, avg. (SD)	8.5 (12.0)	8.6 (11.5)	0.3462
Mortality, %	4.6%	4.0%	0.2216
Payor Group, %			<0.0001
Managed Care	21.8%	50.3%	
Medicaid	35.0%	27.9%	
Medicare	43.2%	21.8%	
Case Mix Index, avg. (SD)	2.408 (2.674)	3.053 (3.327)	<0.0001
Total Costs, avg. (SD)	22,196 (35,018)	27,453 (36,599)	<0.0001
Direct Costs	13,806 (22,557)	17,259 (24,161)	<0.0001
Indirect Costs	8,390 (12,555)	10,194 (12,553)	<0.0001
Total Costs/CMI	8,885 (8,457)	9,354 (8,192)	0.0006
Net Revenue	23,119 (40,341)	34,731 (47,318)	<0.0001
Net Revenue/CMI	9,762 (6,714)	12,364 (11,315)	<0.0001
Contribution Margin	9,313 (25,316)	17,473 (32,627)	<0.0001
Net Profit	923 (23,854)	7,279 (30,388)	<0.0001

NOTES

Session XXVI: Quickshot I - 1- 13
Paper 6: 9:30-9:36 am

Quantifying the Thousands of Lives Lost Due to Poor Emergency General Surgery (EGS Outcomes: Why We Need A National EGS Quality Improvement Program

Zain G. Hashmi MBBS, Molly P. Jarman Ph.D., Joaquim M. Havens* MD, John W. Scott MD,MPH, Eric Goralnick MD, MS, Zara Cooper* MD, Ali Salim* MD, Adil H. Haider* MD,MPH, Brigham and Womens Hospital

Invited Discussant: Angela Ingraham, MD

Introduction: Nearly 4 million Americans present with an Emergency General Surgery (EGS) condition annually, facing significant morbidity and mortality. Unlike elective surgery and trauma, there is no dedicated national quality improvement program to improve EGS outcomes. Our objective is to estimate the number of lives that could potentially be saved through EGS quality improvement in the United States.

Methods: Adults with AAST-defined EGS diagnoses were identified in the Nationwide Emergency Department Sample 2006-2014. Hierarchical logistic regression was performed to benchmark treating hospitals into reliability adjusted mortality quintiles. Weighted generalized linear modeling was used to calculate the relative-risk of mortality at each hospital quintile, relative to best-performing quintile. We then calculated the number of excess, potentially preventable deaths at each hospital quintile versus the best-performing quintile using techniques that have previously been used to quantify preventable trauma deaths.

National Estimate of the Number of Excess Emergency General Surgery Deaths

Quintile of Reliability Adjusted Mortality Rate	Excess Deaths Among All EGS Patients*	Excess Deaths Among Operative EGS Patients*
1st Quintile "Best Performing Hospital Quintile"	Reference	Reference
2nd Quintile	16,981 (15,815-18,117)	3,866 (3,320-4,386)
3rd Quintile	25,254 (24,171-26,310)	6,257 (5,742-6,748)
4th Quintile	41,481 (40,292-42,643)	10,984 (10,431-11,513)
5th Quintile "Worst Performing Hospital Quintile"	74,462 (73,231-75,666)	21,471 (20,896-22,023)
Total Number of Excess EGS Deaths**	**158,177 (153,509-162,736)**	**42,577 (40,389-44,670)**

** Estimate with 95% confidence interval*
***over nine years of Nationwide Emergency Department Sample (NEDS) 2006-2014*

Results: Twenty six million EGS patients were admitted and 6.5 million (25%) underwent an operation. In-hospital mortality varied from 0.3% to 4.1% across the treating hospitals. If all hospitals had outcomes similar to those in the best-performing quintile, 158,177 lives could be saved. Overall, 47% of excess deaths occurred at the worst-performing hospitals, while 27% of all excess deaths occurred among the operative cohort.

Conclusion: Nearly 200,000 deaths could potentially be prevented in just over a decade if EGS outcomes were improved across the nation. A national initiative to enable structures and processes-of-care associated with optimal EGS outcomes is urgently needed to achieve “Zero Preventable Deaths after Emergency General Surgery.”

NOTES

Session XXVI: Quickshot I - 1- 13
Paper 7: 9:36-9:42 am

IMPACT OF A SIMPLIFIED MANAGEMENT ALGORITHM ON OUTCOME FOLLOWING EXSANGUINATING PELVIC FRACTURES: A 10-YEAR EXPERIENCE

Richard H. Lewis Jr., MD, MA, John P. Sharpe MD, Bennett Berning MD, Timothy C. Fabian* MD, Martin A. Croce* MD, Louis J. Magnotti* MD, University of Tennessee Health Science Center - Memphis

Invited Discussant: David Morris, MD

Introduction: Optimal management of exsanguinating pelvic fractures, specifically with respect to stabilization (external pelvic fixation, pelvic orthotic device) and hemorrhage control (angiography) remains controversial. Our previous experience suggested that management decisions based on a defined algorithm were associated with a significant reduction in transfusion requirements and mortality. Based on these outcomes, a clinical pathway for the management of exsanguinating pelvic fractures was developed. The purpose of this study was to evaluate the impact of this pathway on outcomes.

Methods: Consecutive patients over 10 years with blunt pelvic fractures (including vascular disruption, open book component with symphysis diastasis, or sacroiliac disruption with vertical shear) subsequent to the implementation of the clinical pathway were identified. Data regarding patient characteristics, mechanism and severity of injury, severity of shock, adherence to the pathway and outcomes including resuscitative transfusions and mortality were recorded. Patients with hemodynamically unstable pelvic fractures are managed initially with a pelvic orthotic device (POD). For those with continued hemodynamic instability and no extra-pelvic source of hemorrhage, pelvic angiography was performed followed by elective pelvic fixation. Patients managed according to the pathway (PW) were compared to those patients whose management deviated from the pathway (DEV).

Results: 3467 patients with pelvic fractures were admitted. 312 (9%) met entry criteria: 246 comprised the PW group and 66 the DEV group. Injury severity, as measured by ISS (35 vs 36, p=0.55) and admission GCS (10 vs 10, p=0.58), and severity of shock, as measured by admission BE (-7.4 vs -6.4, p=0.38) and admission SBP (107 vs 104, p=0.53), were similar between the groups. There was also no significant difference in PRBC requirements during initial resuscitation (6.1 vs 6.6 units, p=0.22). POD use was only 48% in the DEV group ($p<0.001$). Only 24% of the PW group required angiography compared to 74% of the DEV group ($p<0.001$). Both 48-hour transfusions (11 vs 16, p=0.01) and mortality (35% vs 48%, p=0.04) were reduced in the PW group compared to the DEV group. Pathway adherence was identified as an independent predictor of both decreased transfusions (β =-5.8, p=0.002) via multiple linear regression and decreased mortality (OR 0.38; 95%CI 0.14-0.51) via multivariable logistic regression after adjusting for age, gender, injury severity and severity of shock.

Conclusion: Adherence to a defined clinical pathway simplified the management of exsanguinating pelvic fractures and contributed to a reduction in both transfusion requirements and mortality. Use of this pathway has facilitated the rapid control of life-threatening pelvic hemorrhage while providing the opportunity for definitive operative fixation in a more controlled fashion. In fact, by consistently managing these complex pelvic fractures according to a defined algorithm, an acceptably low morbidity and mortality can be achieved and maintained.

NOTES

Session XXVI: Quickshot I - 1- 13
Paper 8: 9:42-9:48 am

BLUNT SMALL BOWEL PERFORATION (SBP: A MULTICENTER UPDATE 15 YEARS LATER

Samir M. Fakhry* MD, Pamela L. Ferguson Ph.D., Ahmed Allawi MD, Christopher P. Michetti* MD, Anna B. Newcomb Ph.D., Chang Liu Ph.D., East MultiCenter SBP Study Group . Synergy Surgicalists

Invited Discussant: Stephen Gale, MD

Introduction: Previous work demonstrated delays in the diagnosis of blunt SBP with increased mortality associated with inability of CT scans to reliably exclude the diagnosis. We conducted a follow-up multicenter study to determine if these challenges persist 15 years after the original study.
Methods:This multi-center study selected adult cases with ICD-9 CM code for blunt SBP=863.20, no other major injury and at least one abdominal CT within the initial 6 hours. Cases were matched to controls who did not have SBP. Hospital and individual patient data from each center were collected and analyzed. All centers had IRB approval.
Results: Data were available from 39 centers (33 had SBP cases) with 127,919 trauma admissions and 94,743 trauma activations from 10/2013 to 9/2015. 25 centers were Level 1. There were 77 cases (mean age 39, 67.5% male, mean LOS 11.2) and 131 matched controls (mean age 44, 64.9% male with LOS 3.6). SBP cases were 0.06% of admissions and 0.08% of activations. Mean time to surgery was 8.43 hours (median 3.68, IQR 1.95-10.33). Initial CT scan showed free air in 31 cases (40%) and none in controls (table). Initial CT scan was within normal limits in 3 case patients (4.2%) and 84 controls (64%). 5 case patients had a second CT scan; two showed free air (one had an initial normal CT scan). One death occurred among the case patients (mortality rate 1.3%) with a time to surgery of 13.8 hours. Multivariate logistic regression analysis showed that abdominal tenderness, abdominal distention, peritonitis, bowel wall thickening, free fluid and contrast extravasation were significantly associated with SBP.

1ST CT Findings		CONTROL	CASE	P
Free fluid	No	120 (91.6%)	12 (16.7%)	<0.001
	Yes	11 (8.4%)	60 (83.33%)	
Free air	No	131 (100%)	41 (56.9%)	<0.001
	Yes	0 (0%)	31 (43.1%)	
Bowel wall thickening	No	130 (99.2%)	45 (62.5%)	<0.001
	Yes	1 (0.76%)	27 (37.5%)	
Mesenteric stranding	No	130 (99.2%)	55 (76.39%)	<0.001
	Yes	1 (0.76%)	17 (23.61%)	
Contrast extrav.	No	130 (99.2%)	64 (88.9%)	0.001
	Yes	1 (0.76%)	8 (11.1%)	
Solid organ injury	No	119 (90.8%)	67 (93.1%)	0.79
	Yes	12 (9.16%)	5 (6.94%)	
Retroperitoneal blood	No	126 (96.2%)	66 (91.67%)	0.2
	Yes	5 (3.82%)	6 (8.3%)	
Chance fracture	No	129 (98.5%)	70 (97.2%)	0.62
	Yes	2 (1.53%)	2 (2.8%)	
Other	No	96 (73.3%)	56 (77.8%)	0.5
	Yes	35 (26.7%)	16 (22.2%)	

Conclusion: Blunt SBI remains relatively uncommon and continues to present a diagnostic challenge 15 years after our initial multicenter study. Trauma centers appear to have shortened time to surgical intervention with an associated decrease in case mortality. Initial CT scans continue to miss a small but significant number of cases with potentially serious consequences making heightened awareness of this injury and continued clinical vigilance paramount.

NOTES

Session XXVI: Quickshot I - 1- 13
Paper 9: 9:48-9:54 am

THE NEED FOR TRAUMA INTERVENTION (NFTI DEFINES MAJOR TRAUMA MORE ACCURATELY THAN INJURY SEVERITY SCORE (ISS AND REVISED TRAUMA SCORE (RTS: DATA FROM A COLLABORATION OF 35 ADULT AND PEDIATRIC TRAUMA CENTERS.

Jacob W. Roden-Foreman BA, Nakia R. Rapier RN, Michael L. Foreman* MD, Raymond A. Coniglio RN, Constance E. McGraw MPH, Abigail R. Blackmore RN, Vaidehi Agrawal Ph.D., John D. Cull* MD, Marie Campbell RN, Melinda A. Weaver RN, Kevin W. Sexton MD, Jeremy Holzmacher MD, Joseph C. Hess Ph.D., Cheryl F. Workman MSN, The Trauma Measurement Workgroup Baylor University Medical Center At Dallas

Invited Discussant: William Hoff, MD

Introduction: A patient's trauma burden is dependent on anatomic injury, physiologic derangement, and depletion of reserve. Major anatomic injury is typically defined as ISS >15 and major physiologic derangement defined as RTS <4, but there is no common measure of reserve. The Need For Trauma Intervention (NFTI) was developed to identify early consumption of critical resources—thought to reflect major depletion of reserve—based on: (1) receiving PRBC within four hours of arrival; (2) discharge from the ED to the operating room within 90 minutes; (3) discharge from the ED to interventional radiology; (4) discharge from the ED to the ICU with ICU length of stay (LOS) ≥3 days; (5) therapeutic mechanical ventilation within three days; or (6) mortality within 60 hours. Patients meeting any of these criteria are classified NFTI+ and considered to have severely depleted reserves given their need for emergent intervention and/or early mortality. We hypothesized that NFTI would be a better predictor of outcomes and resource requirements than ISS or RTS.

Methods: 35 adult and pediatric US trauma centers submitted data for 88,083 patients. Generalized estimating equations with robust standard errors modeled the effects of ISS >15, RTS <4, and NFTI+ on the odds of mortality, complication, and receiving a full trauma team activation (TTA), as well as LOS and number of procedures performed in 3 days. All models controlled for these three definitions of major trauma, as well as age, mechanism of injury, and hospital.

		Mortality	Complication	Full TTA	Total LOS	Procedures in 3 days
ISS >15	OR/Beta (95% CI)	3.32 (3.00, 3.68)	2.08 (1.83, 2.36)	2.76 (2.31, 3.31)	3.12 (2.66, 3.57)	3.03 (2.39, 3.67)
	Wald χ^2 (p-value)	23.15 (<0.001)	11.25 (<0.001)	11.05 (<0.001)	13.30 (<0.001)	9.32 (<0.001)
RTS <4	OR/Beta (95% CI)	16.87 (14.73, 19.32)	1.27 (1.12, 1.44)	30.63 (9.91, 94.63)	-0.92 (-3.04, 1.19)	-0.73 (-2.18, 0.72)
	Wald χ^2 (p-value)	40.82 (<0.001)	3.81 (<0.001)	5.95 (<0.001)	-0.86 (0.392)	-0.99 (0.323)
NFTI+	OR/Beta (95% CI)	20.31 (17.89, 23.05)	3.01 (2.54, 3.57)	6.13 (5.10, 7.36)	5.02 (4.32, 5.71)	4.46 (3.51, 5.41)
	Wald χ^2 (p-value)	46.58 (<0.001)	12.67 (<0.001)	19.34 (<0.001)	14.20 (<0.001)	9.20 (<0.001)

Results: For all outcomes except receiving full TTA, NFTI was a significantly better predictor than ISS or RTS. The odds of receiving full TTA were highest with RTS, however, RTS's large confidence intervals and smaller Wald χ^2 indicate its predictions may be less reliable. Further, RTS was not predictive of LOS or number of procedures in 3 days.

Conclusion: In this multicenter study, NFTI out-performed the standard anatomic and physiologic definitions of major trauma. By determining depletion of reserve via resource consumption, NFTI appears to be less affected by the idiosyncrasies that confound ISS and RTS (e.g., frailty, comorbidities). NFTI+, therefore, appears to be a better definition of major trauma than ISS >15 and RTS <4. Use of NFTI may enable improved triage monitoring and better case-mix adjustment.

NOTES

Session XXVI: Quickshot I - 1- 13
Paper 10: 9:54-10:00 am

DIAGNOSIS OF DIAPHRAGM INJURIES USING MODERN 256 SLICE CT SCANNERS: TOO EARLY TO ABANDON OPERATIVE EXPLORATION

Rindi Uhlich MD, Parker Hu MD, Jeffrey Kerby* MD,Ph.D., Patrick Bosarge MD,
University of Alabama Birmingham

Invited Discussant: David Skarupa, MD

Introduction: Missed injury of the diaphragm may result in hernia formation, enteric strangulation, and death. Compounding the problem, diaphragmatic injuries are rare and difficult to diagnose with standard imaging. Consequently, for patients with high suspicion of injury, operative exploration remains the gold standard for diagnosis. As no current data exists, we sought to perform a pragmatic evaluation of the diagnostic ability of 256-slice multi-detector CT scanners for diagnosing diaphragmatic injuries after trauma.

Methods: A retrospective review of trauma patients from 2011-2018 with acute diaphragm injury was performed at an ACS verified Level 1 trauma center. Two separate levels of CT scan technology, 64-slice and 256-slice, was used during this time period. Patients without standard CT imaging prior to operative intervention were excluded. Imaging reports were reviewed for the diagnosis of diaphragm injury. Injuries were subsequently graded using operative description per AAST guidelines. Patient demographics, injury patterns, operative details, and outcome results were further recorded.

Results: Two-hundred fifty-nine patients were identified with 62.5% (162/259) receiving preoperative CT scan. The majority underwent 64-slice CT (138/162, 85.2%). Comparing patients receiving 64 or 256-slice CT scan, there was no difference in the side of injury (left side 57.5% vs. 70.8%, p = 0.43) or median injury grade [3 (3, 3) vs. 3 (2, 3)]. 256 –slice CT successfully diagnosed diaphragm injury in 58.3% (14/24) while 64-slice CT identified 47.0% (63/138) of injuries. The false negative rate was lower with 256-slice than 64-slice CT (43.5% vs. 53.8%) overall, among left sided injuries (37.5% vs. 54.2%), and both blunt (16.7% vs. 33.3%) or penetrating (47.1% vs. 62.1%) mechanisms of injury.

Conclusion: New 256-slice multi-detector CT offers improved diagnostic sensitivity in comparison to 64-slice CT. However, given the continued high false negative rate of the 256-slice CT scanner, operative exploration is still required for high suspicion of injury.

NOTES

Session XXVI: Quickshot I - 1- 13
Paper 11: 10:00-10:06 am

HOW SAFE AND EFFECTIVE ARE SMALL-BORE CHEST TUBES AT MANAGING DELAYED HEMOTHORACES COMPARED TO LARGE-BORE CHEST TUBES?

John Cordero MD, Alessandro Orlando MPH, Rebecca Vogel MD, Matthew M. Carrick* MD, Allen Tanner II, MD, David Bar-Or MD, St. Anthony Hospital

Invited Discussant: Ali Salim, MD

Introduction: LB tubes are the standard treatment for emergent hemothoraces (HTXs), but treatment of delayed HTXs remains variable. Previous studies have suggested that small bore (SB, ≤14Fr.) pigtail tubes have the same efficacy for treating traumatic HTXs as large bore (LB, >14Fr.) tubes, but data continues to be insufficient. The goal of our study was to analyze the outcomes of SB tubes in patients with delayed HTX. We hypothesized that SB tubes would be as safe and effective as LB tubes.

Methods: This was a retrospective observational study across 7.5yrs at 3 Level 1 trauma centers. We included patients 1) diagnosed with a HTX, or multiple rib fractures with bloody effusion from chest tube; 2) with an initial chest tube placed ≥36h from hostpial arrival. We excluded tubes placed for hemopneumothoraces. SB tubes were compared to LB tubes. The primary outcome was tube failure (requiring an additional/replacement tube or video-assisted thoracoscopy [VATS]). Secondary outcomes were tube falling out or clogging, pleural empyema, pneumonia, retained HTX (persistent heterogeneous fluid collection detected by CT ≤14d from initial chest tube placement and requiring intervention), time on chest tube, return to prior function (obtained from discharge physical therapy note), and in-hospital mortality. Patients could have had more than one tube in this study and possibly had bilateral tube placement. Dependent and independent analyses were used to assess primary and secondary outcomes. A repeated measures mixed model compared the mean time each tube was placed by tube group (SB vs. LB); the facility was included as a random effect. All tests were two-tailed with an alpha of 0.05. This study was IRB-approved at all sites.

Results: There were 161 SB patients (196 tubes) and 38 LB patients (46 tubes). There were no significant differences between study groups in 13 demographic or injury characteristics. 23 patients had bilateral chest tubes. The median (IQR) tube size for each group was as follows: SB [12Fr. (12-14)] and LB [32Fr. (28-32)]. There was no significant difference in SB and LB groups in the mean (SE) time each tube was in place (91 [24.2] vs. 118 [50.7] hrs, p=0.63). The failure rate of SB tubes was significantly smaller than LB tubes (7% vs. 20%, p<0.001). LB tubes placed in the operating room had nearly 3-fold the failure rate of those placed at the bedside (33% vs. 12%). SB tubes placed in interventional radiology (IR) had 2-fold the failure rate of those placed at the bedside (9% vs. 5%). SB tubes clogged or fell out significantly more often than LB tubes (4% vs. 0%, p<0.001, both); clogged SB tubes ranged 10–14Fr, while those that fell out ranged 12–14Fr. There was no significant difference between SB and LB tubes in rates of retained HTX (14% vs. 13%, p=0.86), pneumonia (9% vs. 0%, p=0.08), in-hospital mortality (1% vs. 5%, p=0.09), or returning to prior function (36% vs. 26%, p=0.27).

Conclusion: SB tubes had a significantly smaller failure rate, similar complication rates, and similar return to prior function rate, compared to LB tubes; however, SB tubes were significantly more prone to clogging and falling out. The median size of SB tubes in this study was smaller than those previously reported in the literature. Our multi-center data lend support to the use of SB tubes for the management of delayed HTXs.

NOTES

Session XXVI: Quickshot I - 1- 13
Paper 12: 10:06-10:12 am

COMPARISON OF 7 AND 11-12 FRENCH ACCESS FOR REBOA: RESULTS FROM THE AAST AORTIC OCCLUSION FOR RESUSCIATION IN TRAUMA AND ACUTE CARE SURGERY (AORTA REGISTRY

Joseph J. DuBose* MD, Jonathan Morrison MD, Megan Brenner* MD, Laura Moore* MD, John Holcomb* MD, Kenji Inaba* MD, Jeremy Cannon* MD, Mark Seamon* MD, David Skarupa* MD, Ernest Moore* MD, Chuck Fox* MD, Joseph Ibrahim MD, Thomas M. Scalea* MD, Uniformed Services University Of The Health Sciences

Invited Discussant: Michael Sise, MD

Introduction:The introduction of low profile devices designed for Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) after trauma has the potential to change practice, outcomes and complication profiles related to this procedure.

Methods:The AAST Aortic Occlusion for Resuscitation in Trauma and Acute Care Surgery (AORTA) registry was utilized to identify REBOA patients from 16 centers -comparing presentation, intervention and outcome variables for those REBOA via traditional 11-12 F access platforms and trauma-specific devices requiring only 7 F access.

Results:From Nov 2013-Dec 2017, 242 patients with completed data were identified, constituting 124 7F and 118 11-12F uses. Demographics of presentation were not different between the two groups, except that the 7F patients had a higher mean ISS (39.2 vs. 34.1, $p = 0.028$). 7F device use was associated with a lower cut-down requirement for access (22.6% vs. 37.3%, $p = 0.049$) and increased ultrasound guidance utilization (29.0% vs. 23.7%, $p = 0.049$). 7F device afforded earlier aortic occlusion in the course of resuscitation (median 25.0 mins vs. 30 mins, $p = 0.010$), and had lower median PRBC (10.0 vs. 15.5 units, $p = 0.006$) and FFP requirements (7.5 vs. 14.0 units, $p = 0.005$). 7F patients were more likely to survive 24 hrs (58.1% vs. 42.4%, $p = 0.015$) and less likely to suffer in-hospital mortality (57.3% vs. 75.4%, $p = 0.003$). Finally, 7F device use was associated with a 4X lower rate of distal extremity embolism (20.0% vs. 5.6%, $p = 0.014$;OR 95% CI 4.25 [1.25-14.45]) compared to 11-12F counterparts.

Conclusion:The introduction of trauma specific 7F REBOA devices appears to have influenced REBOA practices, with earlier utilization in severely injured hypotensive patients via less invasive means that are associated with lower transfusion requirements and improved survival. Additional study is required to determine optimal REBOA utilization.

NOTES

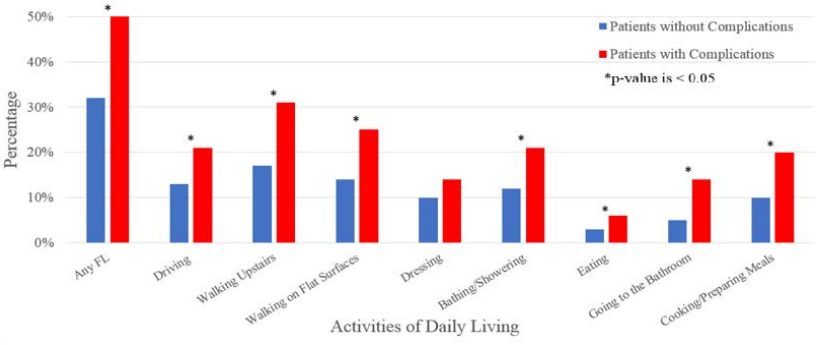
Session XXVI: Quickshot I - 1- 13
Paper 13: 10:12-10:18 am

THE IMPACT OF IN-HOSPITAL COMPLICATIONS ON THE LONG-TERM FUNCTIONAL OUTCOMES OF TRAUMA PATIENTS: A MULTICENTER STUDY.

Jae Moo Lee BA, Juan Herrera-Escobar MD, Michel Apoj BA, Syeda Al Rafai MD, MHA, Kelsey Han BA, Deepika Nehra MD, Ali Salim* MD, Karen Brasel* MD,MPH, George Kasotakis* MD,MPH, George Velmahos* MD,Ph.D., Adil Haider* MD,MPH, Haytham Kaafarani* MD,MPH, Massachusetts General Hospital

Invited Discussant: David Efron, MD

Introduction: The long-term consequences of in-hospital complications in trauma patients remain largely unknown. We sought to study the impact of complications on the long-term functional outcome of trauma patients.
Methods: All patients with Injury Severity Score (ISS) ≥ 9 admitted to three Level I Trauma Centers between 2015 and 2017 were contacted by phone at 6-12 months post-injury and administered a validated Trauma Quality of Life survey assessing for functional limitation (FL). FL was defined as the inability to independently perform one or more activities of daily living (ADL; e.g. driving, walking on flat surfaces/upstairs, dressing, cooking/preparing meals). The medical records were systematically reviewed for additional demographic/socioeconomic variables, comorbidities, injury mechanism/type/severity and the occurrence of pre-defined in-hospital complications. The impact of complications on FL was assessed using univariate then multivariate logistic regression models.
Results: Out of a total of 2511 patients, 1022 patients were included. The mean age was 58 years, 56% were male, 94% had blunt trauma, and the mean ISS was 15. A total of 168 patients (16.4%) had at least one in-hospital complication and reported significantly more FL in most ADLs at 6-12 months, compared to those without complications [Figure]. In multivariable analyses, adjusting for all other variables, the occurrence of an in-hospital complication was associated with a greater likelihood of FL at 6-12 months post-injury [OR = 1.82, 95% CI 1.22-2.69, P = 0.003].
Conclusion: Trauma patients with in-hospital complications have worse functional long-term outcome. In addition to primary complication prevention, more rehabilitation resources should be made available to the subgroup of trauma patients who survive complications.



NOTES

Session XXVIII: Quickshot Session II - #14-26 Saturday September 29, 2018, 10:30 AM-11:48 AM Location: Seaport Foyer, Second Level (Seaport Tower)
Moderator: Elliott Haut, MD, PhD

Session XXVII: Quickshot II - 14-26
Paper 14: 10:30-10:36 am

ARE YOU KIDDING? PEDIATRIC TRAUMA CENTER VERIFICATION IMPROVES OUTCOMES AT AN ADULT CENTER

Sean R. Maloney MD, Eric J. Grossman MD, Ashley B. Christmas* MD, Kyle W. Cunningham MD, Megan E. Waddell RN, BSN, CPEN, Ronald F. Sing* DO, Carolinas Medical Center

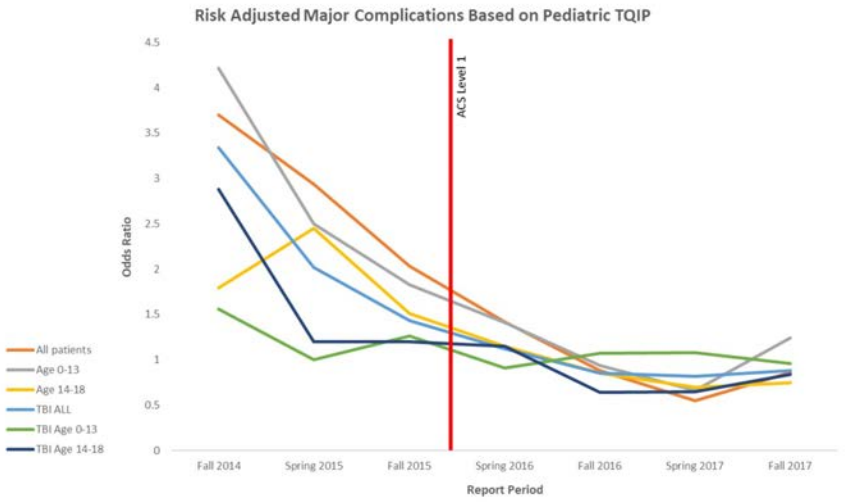
Invited Discussant: Daniel Margulies, MD

Introduction: Trauma continues to be the greatest mortality cause in children. It is known that trauma centers improve outcomes with 103 pediatric trauma centers in the US, of which 54 are level 1. We undertook this study to assess potential outcome improvements associated with the transition from ACS level 2 verification to level 1 status at our pediatric trauma center.

Methods: Pediatric trauma patient outcomes were assessed from Fall 2014- Fall 2017. Within this time frame 20 pediatric clinical guidelines were formed. In 2013, our facility added its first Pediatric Trauma Medical Director.

Results: For all pediatric patients, the risk adjusted major complication odds ratio (OR) was 2.94 in Spring 2015, decreased to 2.03 in Fall 2015 and decreased to 0.86 in Fall 2017. Including death as a complication yielded a similar trend. Analysis of patients aged 0-13 years showed an OR decrease from Spring 2015 to Fall 2015 to Fall 2017 (2.50 to 1.83 to 1.24). Subgroup analysis of the traumatic brain injury cohort, demonstrated similar results (2.02 vs. 1.43 vs. 0.88). There was also a decrease in median length of stay from 3.0 days to 2.0 days from 2015 to 2017. Pneumonia rates in intubated patients decreased throughout this time period (13.3% to 10.8% to 0.2%) as well as unplanned admission to the ICU (5.2% to 0.8% to 0.4%). Of note, for patients requiring craniotomy, median time to the operating room decreased from 4 hours to 2 hours.

Conclusion: During preparation for ACS level 1 pediatric trauma center verification in 2016, our institution noted significant improvements in the outcomes of pediatric trauma patients. Our study is one of the first to look specifically at the improvements in care that are associated with becoming a level 1 pediatric trauma center. Furthermore, these improvements became even more pronounced following the verification process.



NOTES

Session XXVII: Quickshot II - 14-26
Paper 15: 10:36-10:42 am

TRAUMA OVER-TRIAGE, CONCURRENT TRAUMA ACTIVATION AND OVERLAPPING EGS SURGERY ARE NOT ASSOCIATED WITH SHORT OR LONG TERM MORTALITY IN EGS PATIENTS

Matthew C. Hernandez MD, Eric J. Finnesgard BA, Johnathon M. Aho MD,Ph.D., Michelle Junker MD, Ariel Knight MD, Brian D. Kim* MD, Mariela Rivera MD, Daniel Stephens MD, Beth A. Ballinger MD, Donald H. Jenkins* MD, Martin D. Zielinski* MD, Henry J. Schiller* MD, Mayo Clinic - Rochester

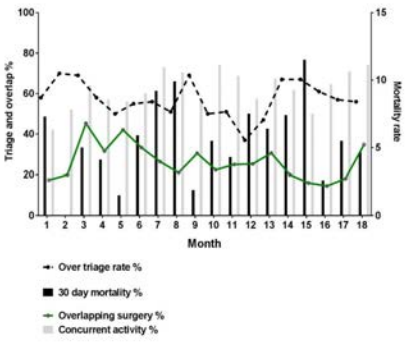
Invited Discussant: Sasha Adams, MD

Introduction: Acute care surgeons manage urgent and emergent tasks that often temporally overlap. Concurrent operations are perceived to impact patient care. However, little is known about the impact of concurrent activities such as trauma activations (TA) with emergency general surgical operations (EGS). We sought to evaluate the frequency and impact of concurrent activity at an institution where a single surgeon takes call for all aspects of acute care surgery at night. We hypothesized that trauma over-triage rates, concurrent activities, and overlapping surgery would affect EGS patient mortality.

Methods: A single institutional review of historical data was performed. Trauma and EGS admissions (for January 2016-July 2017) were reviewed. We included adults (>15 years-old for trauma, ≥18 years-old for EGS). All EGS operations and TA during day-time hours (08:00-16:30) were excluded as multiple surgeons would have been present to provide coverage. Patients were categorized as concurrent when a TA (notification to ED discharge) coincided with an EGS operation (incision to closure). EGS overlap was defined as two EGS cases in progress at the same time but the critical portion of the case did not. Baseline demographics, ISS (Injury Severity Score), American Association for the Surgery of Trauma (AAST) EGS grade, American Society of Anesthesiologist (ASA) score, duration of hospitalization, 30-day readmission, 30-day and overall mortality were abstracted. Monthly triage rates were calculated by Cribrari Matrix method, trauma over-triage was considered at >50%. Unadjusted Kaplan-Meier analysis and adjusted Cox proportional hazards models quantified survival.

Results: In this study, EGS (n=1135), and TA (n=1324) patients were reviewed. The monthly triage rate ranged from 37 to 70% (median 56%). The overall concurrent activity rate for EGS and TA was 62.5% (n=710). The EGS overlapping surgery rate was 26.5% (n=301). Outcomes in EGS patients with concurrent TA were similar to those without TA with regard to duration of stay (median [IQR]) (2 [0-9] versus 4 [1-11] days, p=0.74), 30-day mortality rates (5.5% versus 5.6%, p=1), and 30-day readmission (49.4% versus 44.9%, p=0.16). Similarly, outcomes in TA patients that coincided with a concurrent EGS case did not differ significantly for duration of stay (4 [2-7] versus 4 [2-8] days, p=0.54), 30-day readmission rates (10.4% versus 8.5%, p=0.88) or thirty-day mortality rates (3.5% versus 3%, p=0.64). In operative EGS patients, factors that were independently associated with thirty-day and one year mortality included AAST EGS grade, ASA, and age but not overlapping EGS surgery, concurrent TA activation, or trauma over-triage rate >50% **Table**.

Conclusions: To foster transparency and examine adequate staffing we aimed to define the extent of concurrent and overlapping acute care surgical tasks at night. The rate of concurrent EGS and TA was 62.5% when a single surgeon was covering night call. In this initial analysis, concurrent TA, trauma over-triage (>50%), or overlapping EGS surgeries did not appear to impact thirty day or one-year EGS patient mortality. Conversely, increased patient EGS disease severity, age, and ASA score were associated with short and long term mortality. Prospective study is required to better appraise acute care surgical practices, concurrent activities and their impact on patient specific outcomes.



Cox proportional hazard model of factors associated with thirty-day mortality of EGS patients

Variable	Risk ratio with 95 % CI	P value
Concurrent	1.1 (0.7-1.6)	.7
AAST EGS grade (III, IV,V)	2.7 (1.5-5)	.001
Age (>65 years)	2.8 (1.8-4.6)	.001
ASA class (III, IV, V)	6.7 (2.9-19.5)	.001
Trauma over-triage (>50%)	1.2 (0.7-2)	.4
Overlapping EGS surgery	1 (0.6-1.7)	.7

Cox proportional hazard model of factors associated with one-year mortality of EGS patients

Variable	Risk ratio with 95 % CI	P value
Concurrent	1 (0.6-1.5)	.8
AAST EGS grade (III, IV,V)	2.8 (1.5-5.3)	.001
Age (>65 years)	2.8 (1.8-4.5)	.001
ASA class (III, IV, V)	6.6 (2.8-19.2)	.001
Trauma over-triage (>50%)	1.2 (0.7-2)	.4
Overlapping EGS surgery	1 (0.6-1.6)	.9

NOTES

Session XXVII: Quickshot II - 14-26
Paper 16: 10:42-10:48 am

BETA-ADRENERGIC BLOCKADE FOR TREATMENT OF TRAUMATIC BRAIN INJURY: A RANDOMIZED CONTROLLED TRIAL

Thomas J. Schroeppel* MD, MS, John P. Sharpe MD, MS, Charles P. Shahan MD, MS, L. P. Clement PharmD, Louis J. Magnotti* MD, Marilyn Lee PharmD, Micheal Muhlbauer MD, Jordan A. Weinberg* MD, Elizabeth A. Tolley PhD, Martin A. Croce* MD, Timothy C. Fabian* MD,
Univeristy Of Colorado Health - Memorial Hospital

Invited Discussant: Bryan Cotton, MD

Introduction: Traumatic brain injury (TBI) is a leading cause of death and disability. While options for preventing primary injury are limited, routine interventions preventing secondary injury due to hypoxia and hypotension are within the armamentarium of current critical care. Other successful interventions have been elusive. Catecholamine surges following TBI are proportional to the severity of the underlying TBI. Multiple retrospective, observational studies have shown a benefit of beta-blockade, with propranolol appearing to be the most effective agent. Sufficient data exists to justify testing this intervention in a randomized controlled trial. In this pilot study, we tested the hypothesis that propranolol given within 72 hours to patients with moderate to severe TBI would improve mortality.

Methods: A single-center randomized controlled pilot trial was conducted at an urban level-one trauma center from 1/1/16 to 12/31/17. Adult patients with a TBI as determined by GCS<12 on admission and a documented injury on head CT were screened for eligibility. Patients with significant injury in another body region (AIS>3), special populations, and home beta-blocker use were excluded from randomization. Following appropriate informed consent, patients were randomized within 72 hours of injury using block randomization in groups of 4. Patients randomized to the propranolol group (PRO) were started on propranolol 20 mg TID and titrated up by 60 mg/day until heart rate was less than 100. The control group was managed according to institutional standards based on the Brain Trauma Foundation Guidelines. Medication duration was 14 days and patients were followed until death or discharge. Demographics, physiologic variables, severity of injury, LOS, urinary catecholamines, and mortality were compared between groups. Primary outcome was mortality and secondary outcome was effect on urinary catecholamines. Statistical analysis was performed using Student's t test or Wilcoxon Rank Sum test based on distribution. *Chi*-square or Fisher's exact test was used for categorical variables where appropriate. A nested factorial mixed model ANOVA with repeated measures was used to estimate differences between treatment arms over time. The trial is registered on clinicaltrials.gov.

Results: Over the 24-month study period, 525 patients were screened and 26 were randomized. One patient was excluded after randomization due to home beta-blocker use. At randomization, the groups were comparable with no differences in demographics or clinical variables (table). The PRO group had a longer hospital LOS (p=0.024), but no difference was found in ICU LOS. Mortality was lower in the PRO group (7.7% vs 36.4%), but this difference did not reach significance. Several differences were found in heart rate, temperature, mean arterial pressure, and ICP on a daily basis both *between* and *within groups*. No overall differences were detected for heart rate (p=0.143), temperature (p=0.339), or ICP (0.141). Mean arterial pressure was significantly higher in the PRO group as compared to the control (p=0.021). No overall treatment effect was noted for GCS (p=0.419), but day 14 GCS was significantly higher in the PRO group (11.7 vs. 8.9l; p=0.044). No differences were found in the levels of urinary catecholamines over the study period. Despite not being different at the traditional significance level, all daily urinary catecholamines were higher in the PRO group from study day 2 to the end of the study.

	PRO n=13	Control n=12	p
Age (Years)	49.7 (±19.0)	53.0 (±21.9)	0.689
Female	36.0%	41.7%	0.688
Blunt	88.0%	91.7%	0.999
ISS	21.9 (±4.2)	21.8 (±5.5)	0.965
Head AIS	3 (3,4)	4 (3,4)	0.611
Charlson Index	1 (0,2)	2 (0.5, 3.5)	0.351
24-Hr Transfusions	0 (0,2)	0 (0,0)	0.389
Base Deficit (meq/L)	-4.8 (±2.6)	-2.4 (±4.7)	0.132
Lactate (mmol/L)	2.2 (±1.3)	2.8 (±2.1)	0.371
LOS (Days)	31 (±12)	20 (±10)	0.024
ICU LOS (Days)	16 (±7)	16 (±7)	0.821
Mortality	7.7%	36.4%	0.142

Conclusion: This trial protocol is safe and feasible in the TBI population. While not powered to detect differences between groups, the PRO group had a higher mean arterial pressure and GCS was significantly better at the end of study despite no difference in mortality. A larger multi-center trial is needed to validate these initial results and increase the power to detect clinically meaningful differences between the treatment arms.

NOTES

Session XXVII: Quickshot II - 14-26
Paper 17: 10:48-10:54 am

Physiologic impact of XSTAT 30 use in the management of non-compressible torso hemorrhage

Alicia Bonanno MD, Todd Graham BS, Lauren Wilson BS, James D. Ross Ph.D.,
Oregon Health & Science University

Invited Discussant: Travis Polk, MD

Introduction: Non-Compressible Torso Hemorrhage (NCTH) remains one of the leading causes of death in both civilian and military pre-hospital care. Novel techniques for management of NCTH like REBOA, selective aortic arch perfusion (SAAP) and the Abdominal Aortic Junctional Tourniquet-Torso Plate, have high potential for significant co-morbidities including ischemia-reperfusion injury when applied in the prolonged field care paradigm. One promising avenue for control of abdominal NCTH is through the novel use of RevMedx XSTAT 30 (an FDA approved sponge-based dressing utilized for extremity wounds). We hypothesized that XSTAT would effectively mitigate uncontrolled NCTH during a prolonged pre-hospital period with correctable physiologic dyshomeostasis following damage control surgery (DCS), resuscitation and critical care. In addition we examined the incidence of intra-cavitary pellets remaining following DCS prior to definitive closure by radiologic investigation.
Methods: Twenty-four male swine (53±2kg) were anesthetized, underwent line placement for monitoring, laparotomy and splenectomy. Animals then underwent laparoscopic transection of 70% of the left lobe of the liver and were allowed to hemorrhage freely for a period of 10 minutes. They were then randomized into three groups: Hextend (Hex), Free Pellets (FP), and Bagged Pellets (BP). The animals were observed for a pre-hospital period of 180 minutes. At 180 minutes the surviving animals underwent DCS, balanced blood product resuscitation and removal of pellets followed by an ICU period of 5 hours with pre-defined paramaters for clinical intervention and care. Postoperative fluoroscopy was performed to identify pellets or bags not recovered during DCS.
Results: Baseline physiologic and injury characteristics were not different. Survival rates were significantly higher in FP and BP ($p<0.01$) vs Hex. DCS duration was significantly longer in FP in comparison to BP ($p=0.001$). There were two animals in the FP group with pellets discovered on fluoroscopy following DCS in comparison to zero in the BP group. There was no significant difference in blood product administration or pressor requirements between groups. End ICU lactates trended to baseline in both FP and BP groups.
Conclusion: In the setting of abdominal hemorrhage, XSTAT may be a viable intervention to address NCTH in pre-hospital care as demonstrated by improved survival in comparison to fluid resuscitation alone without secondary consequences of critical metabolic dyshomeostasis. XSTAT can be easily identified and removed prior to definitive abdominal closure.

NOTES

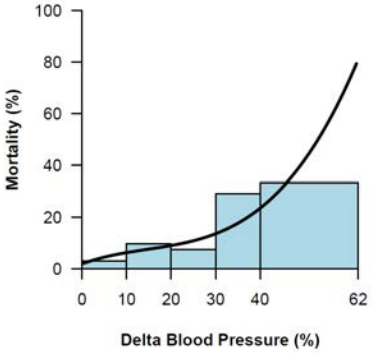
Session XXVII: Quickshot II - 14-26
Paper 18: 10:54-11:00 am

PERCENT CHANGE FROM PRE-INJURY BLOOD PRESSURE IS AN INDEPENDENT PREDICTOR OF MORTALITY IN ELDERLY TRAUMA

Savo Bou Zein Eddine MD, Kelly A. Boyle MD, Christopher M. Dodgion MBA,MD, MSPH, Colleen Trevino Ph.D.,RN, FNP, Jeremy S. Juern* MD, Thomas W. Carver* MD, Christopher S. Davis MD,MPH, David J. Milia MD, Panna A. Codner* MD, Jacob R. Peschman MD, Travis P. Webb* MD, MHPE, Marc A. De Moya* MD, Medical College of Wisconsin

Invited Discussant: Jennifer Hubbard, MD

Introduction: The correlation between baseline blood pressure and outcomes has been poorly studied. We hypothesize that a decrease from baseline (preinjury) systolic blood pressure(SBP) is an independent predictor of mortality among elderly trauma patients. **Methods**: The 2010 to 2017 trauma registry at a Level 1 Trauma Center was linked to the electronic health records to identify patients aged ≥65 years old with available baseline SBP. Baseline SBP (bSBP) was defined as the average of the last 3 SBP measurements recorded within 2 years of the trauma date in an ambulatory clinic or an outpatient setting. Trauma SBP (tSBP) was defined as the first SBP reading in the Emergency department after presentation for trauma. Delta SBP (dSBP) was defined as the percent change of tSBP from bSBP. Univariate and logistic multivariate regression analysis were constructed to assess the independent impact of the bSBP and the change from bSBP on mortality controlled for demographics, comorbidities, injury mechanism/severity. **Results**: A total of 2059 patients met our inclusion criteria with a mean age of 79.8 years (65.0 -102.0, ±8.4) and mean bSBP of 131.3 mmHg (75.3 – 209.0, ±17.5). Mortality was 5.0% in this cohort. Of these patients, 533 (25.9%) had a decrease in tSBP from their bSBP (or dSBP>0) on presentation to the emergency department. In the unadjusted analysis, sex ($p< 0.001$), Glasgow Coma Scale (GCS) ($p<0.001$), Injury Severity Score (ISS) ($p<0.001$), mechanism of injury ($p<0.001$), tSBP ($p=0.002$), and dSBP ($p<0.001$) were significant predictors of mortality. In the multivariate analyses, 10% change from bSBP [OR= 1.39, (95% CI: 1.02, 1.90)] and male sex [OR=3.45, (95% CI: 1.49, 8.01)] were significant predictors of mortality. GCS 13-15 [OR=0.03, (95% CI: 0.01, 0.07)] was a protective factor. Mortality exponentially increased after a 20% decrease of blood pressure or more from bSBP.
Conclusion: A decrease from baseline preinjury SBP by 10% or more is an independent predictor of mortality in the elderly trauma patient.



NOTES

Session XXVII: Quickshot II - 14-26 Paper
19: 11:00-11:06 am

THE NLRP3 INFLAMMASOME PATHWAY LEADS TO THE LOSS OF BLOOD-BRAIN BARRIER INTEGRITY IN TRAUMATIC BRAIN INJURY

Bobby D. Robinson MD, Chinchusha Anasooya Shaji BS, Claire L. Isbell MD, Stanley Kurek* Jr., DO, Justin Regner MD, Binu Tharakan Ph.D., Baylor Scott And White Medical Center - Temple

Invited Discussant: Mayur Patel, MD, MPH

Introduction: The integrity of the blood-brain barrier (BBB) is critical in limiting vasogenic cerebral edema following traumatic brain injury (TBI). The proinflammatory cytokine interleukin 1β (IL-1β) is a critical mediator of BBB breakdown following TBI. The NLRP3 inflammasome pathway activated in TBI regulates IL-1β secretion. We hypothesized that the activation of this pathway is critical to BBB breakdown and hyperpermeability resulting in cerebral edema following TBI.

Method: *In vitro* studies consisted of immunofluorescence of tight junction-associated proteins and monolayer permeability for evaluating barrier function. Rat brain microvascular endothelial cells (BMECs) were treated with chitosan, an NLRP3 inflammasome activator. The tight junction protein zonula occludens-1 (ZO-1) and adherens junction protein β-catenin were localized. Human BMECs were grown as a monolayer on Transwell plates; permeability was induced with chitosan, and transendothelial electrical resistance (TEER) was performed to evaluate barrier function. *In vivo* studies utilized a mouse controlled cortical impact model of moderate TBI in C57/BL6 mice. Sham mice had craniectomy only (n=5/group). Chitosan and inhibitors (NLRP3 inhibitor MCC950 and caspase-1 inhibitor Ac-YVAD-cmk) were administered 10 minutes after injury (n=5/group). Intravital microscopy imaging of the pial venules was performed for up to 70 minutes after injury. The difference in fluorescence intensity between the intravascular space and interstitium (ΔI) was measured and represented BBB hyperpermeability.

Results: Junctional localization of ZO-1 and β-catenin showed decreased integrity when treated with chitosan *in vitro*. Chitosan administration led to a decrease in the TEER in human BMECs ($p<0.05$). TBI resulted in significant increase in BBB permeability when compared to sham group ($p<0.05$). Chitosan administration led to BBB hyperpermeability compared to control group ($p<0.05$) *in vivo*. Treatment with the caspase-1 and NLRP3 inhibitors significantly decreased BBB hyperpermeability after TBI ($p<0.05$).

Conclusion: Activation of the NLRP3 inflammasome pathway leads to BBB breakdown/microvascular hyperpermeability *in vitro* and *in vivo*, and specific pathway inhibitors mitigates these effects.

NOTES

Session XXVII: Quickshot II - 14-26
Paper 20: 11:06-11:12 am

OBESITY IS NOT ASSOCIATED WITH MICROVASCULAR INFLAMMATION FOLLOWING INJURY

Robert D. Winfield* MD, James M. Howard MD, John G. Wood Ph.D., University Of Kansas Medical Center

Invited Discussant: Carlos Brown, MD

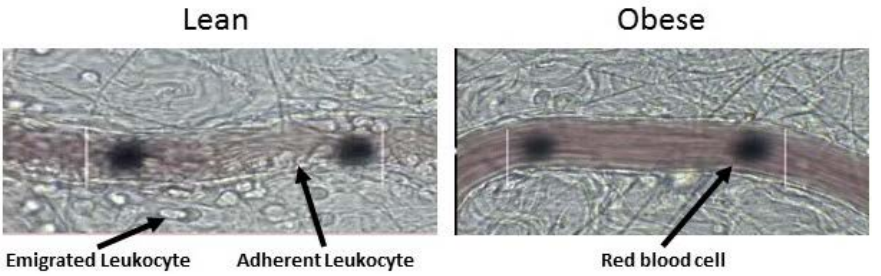
Introduction: Obesity is associated with organ failure and thromboembolic events following injury. Prior work has demonstrated that although obesity is associated with a pro-inflammatory state in the uninjured, the obese show relative immune suppression following major trauma. Furthermore, although obesity is clearly linked to hypercoagulability, circulating markers with pro-inflammatory and procoagulant properties are not elevated following trauma while simultaneously showing greater expression in adipose tissue. This dichotomy suggests a possible adipose-mediated perivascular effect that might explain an increased propensity for thrombosis in the obese. We hypothesized that we would see evidence of enhanced microvascular inflammation in obese subjects following injury.

Methods: Sprague-Dawley rats were divided into groups in which they were fed either a standard diet or high-fat, high calorie diet for eight weeks. To create injury, the backs of experimental subjects were exposed to steam for one minute while controls were not exposed to steam. Leukocyte adherence (LA) in mesenteric venules of anesthetized experimental and control subjects was measured using intravital microscopy. Adherent leukocytes were defined as those that remained stationary to the venular wall for at least 30 seconds, and expressed as number per 100 μm venular length.

Results: Obese subjects weighed significantly more than lean at the time of injury (452 ±16.3 vs. 366±12.7 grams, $p<0.05$). In subjects fed standard diet, LA increased four hours after burn (16.2±2.2 vs 1.4±0.3 per 100 μm at 0 minutes, $p<0.05$, $n=7$), but not in controls (2.3±0.3 vs 1.5±0.3 per 100 μm at 0 minutes, $n=7$). At four hours after burn, lean subjects showed a significant increase in leukocyte adherence over obese subjects (12.9±2.6 vs 3.1 ±0.3 per 100 μm, $p<0.05$), with the obese showing limited evidence of leukocyte adherence and emigration at four hours following injury. Figure 1 shows representative photographs of the microcirculation 4 hours after burn in lean and obese subjects.

Conclusion: While burn injury led to microvascular inflammation in lean subjects, there was minimal inflammation in the mesenteric microvasculature of the obese. This is consistent with previous work demonstrating that obesity in the setting of trauma leads to a state of relative immune suppression. These data do not support the notion that adipose-mediated perivascular inflammation is a causative factor for increased thromboembolic phenomena in the obese following injury.

Figure 1. Leukocyte adherence in mesenteric venules four hours following burn injury



NOTES

Session XXVII: Quickshot II - 14-26
Paper 21: 11:12-11:18 am

THE DIVERSITY OF SURGICAL CRITICAL CARE: A REPORT OF THE TRAUMA ICU PREVALENCE PROJECT (TRIPP, AN AAST MULTI-INSTITUTIONAL STUDY

Christopher P. Michetti* MD, Samir Fakhry* MD, Karen Brasel* MD, Niels Martin* MD, Erik Teicher MD, Anna Newcomb Ph.D., Inova Fairfax Hospital

Invited Discussant: Panna Codner, MD

Introduction: Surgical Critical Care is crucial to the care of trauma and surgical patients. This study was designed to provide a contemporary assessment of patient types, injuries, and conditions in ICUs caring for trauma patients to inform the design of processes of care to meet patient needs.

Methods: This was a 1-day, multicenter prevalence study where participants supplied data on all patients in their TICU (ICU where majority of critical trauma patients were admitted) on 11/2/17 and their 30-day outcomes.

Results: 27 Level I and 3 Level II trauma centers across the U.S. entered 501 pts classified as: 244 (48%) trauma, 167 (33%) non-trauma surgical, 90 (18%) medical. The most prevalent injuries, surgical conditions, ICU diagnoses, and operations are shown in the Table. 360 patients (72%) underwent surgery, 5.7% had an open abdomen. 163 (33%) had an infection: 51(10%) intra-abdominal, 43(8.5%) ventilator-associated pneumonia, 32 (6.3%) soft tissue, and 28 (5.5%) other pneumonia. 278 (55%) were on antibiotics, and 51 (10%) on antifungal agents. 338 (67%) had been intubated, with 46% currently on a ventilator. 95 (19%) had a tracheostomy (performed after a median 8 days [IQR 5-12] of intubation). Arterial and central lines were each present in >36% of patients; 62.6% had a urinary catheter. 15% of patients were on vasoactive infusions and 64 (12.8%) were on both vasoactive drugs and a ventilator. 14.5% were comatose and 36 (7.1%) had intracranial pressure monitors. Altered mental status (46%) and enteral opioid use (47%) were common. 20% of patients had a transfusion within the last 24 hours. 30-day follow-up data were available for 440 patients (88%). 12 were still in the ICU, median ICU days were 10 [4-19] and hospital days were 17 [9-31]. Mortality was 13% (n=57).

Injuries	n (%)	ICU conditions	n (%)
Brain	102 (41.8%)	Respiratory failure	244 (48.7%)
Rib fracture	101 (41.4%)	Acute anemia	141 (28.1%)
Pneumo/hemothorax	76 (31.1%)	Sepsis	82 (16.3%)
Facial fracture	59 (24.1%)	Delirium	79 (15.7%)
Leg fracture	50 (20.4%)	Acute kidney inj.	76 (15.1%)
Non-trauma surgical conditions		**Operations**	
Abdominal	56 (33.5%)	Abdominal	122 (24.3%)
Other Gen Surgery	34 (20.3%)	Extremity ortho.	63 (12.5%)
Neurological	22 (13.1%)	Vascular	53 (10.5%)
Vascular	21 (12.5%)	Soft tissue	45 (9.9%)
Transplant	11 (6.5%)	Spine	44 (8.7%)

Conclusion: Acuity of trauma ICUs in the U.S. is very high, as is the breadth of pathology and the interventions provided. Further assessment of the global predictors of outcome is needed to inform the education, research, clinical practice, and staffing of surgical critical care providers.

NOTES

Session XXVII: Quickshot II - 14-26
Paper 22: 11:18-11:24 am

TEACHING HOW TO STOP THE BLEED: DOES IT WORK? A PROSPECTIVE EVALUATION OF TOURNIQUET APPLICATION IN SECURITY AND LAW ENFORCEMENT PERSONNEL

Fahd Ali MD, Patrizio Petrone MD,MPH, MSHSA, Ellen Berghorn RN, Judy Jax RN, Lee Cartagena MD, Collin E. Brathwaite MD, D'Andrea Joseph* MD, NYU Winthrop Hospital

Invited Discussant: Babak Sarani, MD

Introduction: In October 2015, the "Stop the Bleed (STB)" program, the brain child for Dr. Lenworth Jacobs, was launched by the White House as a call to action for the use of bleeding control techniques by persons at the scene of traumatic injury. With death possible within 5 minutes of injury from a major vascular trauma, prompt control of hemorrhage is key. Wartime data from 2000's demonstrated that the correct tourniquet use has a mortality benefit of 13-51% while incorrect application was associated with lesser reduction in mortality. Studies have shown that proper education leads to individuals becoming more apt to use tourniquets in the field. The purpose of this study was to conduct a pre and post evaluation of the STB course in a group of private security and law enforcement personnel.

Methods: A pre and post questionnaire using the Likert scale was shared with law enforcement and security personnel on their knowledge and comfort level with the use of tourniquets. Participants were also observed while placing tourniquets and the time for placement recorded. The didactic portion and practical session of the STB was then taught and participants were again observed placing tourniquets and a clean copy of the questionnaire distributed. Fisher's Exact tests or Wilcoxon matched-pairs signed-ranks tests were used, as appropriate, to compare pre-post measurements.

Results: A total of 54 subjects were enrolled over the course of three sessions. The tourniquet was applied correctly by 14.5% (8/54) and 92.6% (50/54) of enrollees at the pre- and post-instruction assessments, respectively ($p<0.001$). Mean times to apply the tourniquet were 28.4±11.9 and 19.5±6.6 min, respectively ($p<0.001$). Subjects reported their level of comfort with the tourniquet to be 5.7±3.2 and 8.9±2.0, respectively ($p<0.001$) and their familiarity with anatomy and bleeding control to be 5.6±3.3 and 8.1±2.3, respectively ($p<0.001$). At the end of the course, the mean score in response to a question about the extent to which the explanation had helped was 8.8±2.1 (95% CI: 8.2 to 9.4) and to a question about the extent to which teaching would make them feel more secure and safe was 8.8±2.3 (95% CI: 8.2 to 9.4).

Conclusion: The teaching of STB improved the correct placement of tourniquets and demonstrated dramatic improvements in application time. Moreover, participants reported increased levels of comfort with addressing active bleeding and found the course to be invaluable. These findings illustrate the importance of the STB program and validate the need for ongoing education.

NOTES

Session XXVII: Quickshot II - 14-26
Paper 23: 11:24-11:30 am

WHEN IS IT SAFE TO START VTE PROPHYLAXIS AFTER BLUNT SOLID ORGAN INJURY? A PROSPECTIVE STUDY FROM A LEVEL I TRAUMA CENTER

Morgan Schellenberg MD,MPH, Kenji Inaba* MD, Patrick Heindel BS, Elizabeth Benjamin* MD,Ph.D., Aaron Strumwasser MD, Kazuhide Matsushima MD, Lydia Lam* MD, Demetrios Demetriades* MD,Ph.D., LAC+USC Medical Center

Invited Discussant: Forrest Fernandez, MD

Introduction: The optimal timing of venous thromboembolism (VTE) prophylaxis initiation after blunt solid organ injury is controversial. Trauma patients are known to be at high risk for VTE, but competing concerns about bleeding exist in patients with blunt solid organ injuries. Retrospective studies suggest initiation within 48 hours is safe. This study was designed to prospectively study the timing of VTE prophylaxis initiation among patients managed nonoperatively after blunt solid organ injury in order to determine the optimal window for initiation of VTE prophylaxis.

Methods: All patients presenting to our Level I trauma center after blunt trauma over a 1 year period (12/01/16 to 11/30/17) were prospectively screened for inclusion in this observational study. Patients were included if a solid organ injury (liver, spleen, and/or kidney) was diagnosed on the initial CT scan and a plan was made for nonoperative management. Patients were excluded if they were transferred to or from an outside hospital, managed operatively from the outset, or on home anticoagulation. Angioembolization was not an exclusion criterion. Demographics, injury and clinical data, type and timing of initiation of VTE prophylaxis, and outcomes (need for blood transfusion, need for delayed IR or OR intervention, hospital LOS, ICU LOS, mortality, and complications including DVT and PE) were collected. The decision to initiate VTE prophylaxis was at the discretion of the attending surgeon. Outcomes were compared between patients who underwent VTE prophylaxis initiation ≤48 hours vs >48 hours after hospital admission.

Results: After applying exclusion criteria, 198 patients were identified over the 1 year study period who sustained a blunt solid organ injury managed nonoperatively. Mean age was 40 years (range 16-92) and 65% of patients were male (n=129). Liver injuries were most common (n=104, 52%), followed by spleen (n=78, 39%) and kidney (n=45, 23%). Mean grade of injury was 3 (range 1-5) for liver, 2 (range 1-5) for spleen, and 3 (range 1-5) for kidney. Mean time of initiation of VTE prophylaxis was 69 hours after admission. As compared to patients who were initiated on VTE prophylaxis >48 hours after admission (n=88, 45%), patients who were initiated ≤48 hours (n=109, 55%) had fewer DVTs (0 vs 9, p=0.006) and VTEs (2 vs 15, p=0.004) but similar numbers of PEs (2 vs 6, p=0.254). No patients in either group required delayed IR or OR for bleeding after initiation of VTE prophylaxis.

Conclusion: In this prospective observational study of patients with blunt solid organ injuries managed nonoperatively, early (≤48h) initiation of VTE prophylaxis resulted in a lower incidence of VTE without an associated increase in the risk of bleeding or need for operative intervention or angioembolization. Early initiation of VTE prophylaxis is therefore likely to be beneficial for patients with blunt solid organ injury. A prospective multicenter trial should be performed to validate these findings.

NOTES

Session XXVII: Quickshot II - 14-26
Paper 24: 11:30-11:36 am

THROMBOPROPHYLAXIS WITH NOVEL ORAL ANTICOAGULANTS IS ASSOCIATED WITH LOWER VENOUS THROMBOEMBOLIC EVENTS IN OPERATIVE SPINE TRAUMA

Muhammad Zeeshan MD, Mohammad Hamidi MD, Narong Kulvatunyou* MD, Faisal Jehan MD, Lynn Gries MD, Andrew Tang* MD, Terence O'Keeffe* MD, El Rasheid Zakaria MD,Ph.D., Bellal Joseph* MD, University of Arizona - Tucson

Invited Discussant: Mark Cipolle, MD, PhD

Introduction: Patients with spinal trauma are at high-risk for venous-thromboembolism (VTE). The use of novel oral anticoagulants (NOACs) for thromboprophylaxis is becoming more prevalent after elective orthopedic procedures. However, there is a paucity of data regarding the use of NOACs in trauma patients. The aim of our study was to assess the impact of NOACs vs low molecular weight heparin (LMWH) for thromboprophylaxis in patients with operative spinal trauma.
Methods: A 2-year (2015-16) review of patients with isolated spine trauma (S-AIS≥3 and other region-AIS<3) who underwent operative intervention and received LMWH or NOACs for thromboprophylaxis. Patients were stratified into two groups based on the type of thromboprophylaxis: NOACs and LMWH; and were matched in a 1:2 ratio using propensity-score-matching for demographics, admission vitals, injury parameters, type of operative intervention, hospital stay, and timing of initiation of thromboprophylaxis. Outcomes were rates of DVT and/or PE, pRBCs transfusion, the rate of operative interventions for spinal cord decompression and mortality after initiation of thromboprophylaxis.
Results: A total of 6036 patients had isolated spine trauma and underwent operative intervention, of which 810 patients (NOACs: 270; LMWH: 540) were matched. Mean age was 50±20y, 64% were males, and median ISS was 14 [9-18]. Matched groups were similar in demographics, injury parameters, ED-Vitals, hospital stay, rates of IVC filter placement and timing of initiation of thromboprophylaxis. The overall rate of DVT was 5.6%, PE was 1.6, and mortality was 2.5%. Patients who received NOACs, were less likely to develop DVT (1.8% vs 7.4%, $p<0.01$) and PE (0.3% vs 2.1%, $p=0.04$). There was no difference in post-prophylaxis pRBCs transfusion requirements ($p=0.76$), post-prophylaxis decompressive procedure on the spinal cord ($p=0.49$), and mortality ($p=0.48$).
Conclusion: In patients with operative spine trauma, thromboprophylaxis with novel oral anticoagulants is associated with lower rates of DVT and PE. NOACs can be considered as an alternative to reduce the risk of VTE in this high-risk patient population. Further prospective clinical trials should evaluate the role of NOACS in preventing VTE events.

Table 2. Primary and Secondary outcome measures of the study

Variables	NOACs (n=270)	LMWH (n=540)	*P-value*
Primary			
DVT, % (n)	1.8% (5)	7.4% (40)	<0.01
PE, % (n)	0.3% (1)	2.1% (12)	0.04
Secondary			
Post-prophylaxis pRBCs transfusions received, % (n)	1.8% (5)	1.4% (8)	0.76
Post-prophylaxis decompression of spinal cord, %(n)	1.5% (4)	0.9% (5)	0.49
Mortality, % (n)	1.8% (5)	2.7% (15)	0.48

DVT = Deep Venous Thrombosis, PE = Pulmonary Embolism, pRBCs= Packed Red Blood Cells

NOTES

Session XXVII: Quickshot II - 14-26
Paper 25: 11:36-11:42 am

AMERICAN FIREARM HOMICIDES: THE IMPACT OF YOUR NEIGHBORS

Erik J. Olson MD, Mark Hoofnagle MD, Elinore Kaufman MD, Patrick M. Reilly* MD, Mark J. Seamon* MD, University of Pennsylvania

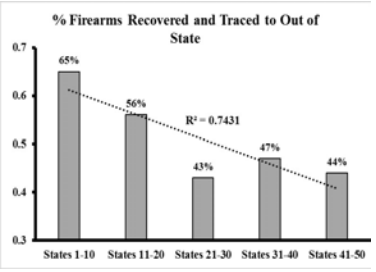
Invited Discussant: Omar K. Danner, MD

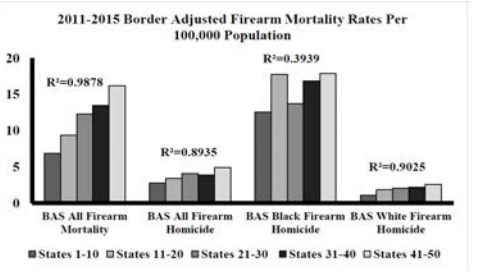
Introduction: Previous reports demonstrated that restrictive state firearm legislation correlated with decreased overall, white, suicide, and pediatric firearm fatality rates (FFR) but did not correlate with homicide or black FFR. We hypothesized that firearm trafficking from less restrictive neighboring states influences firearm homicide rates, making individual state firearm laws less effective.

Methods: For the years 2011-2015, state firearm legislation Brady Campaign to Prevent Gun Violence scorecards were analyzed in relation to firearms traced to specific states by the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) and reported Center for Disease Control and Prevention FFR (WISQARS). All states were then ranked by Brady score (Normalized Brady Score [NBS]) and arranged by quintile. The effect of less-restrictive neighboring states on the 10 most-restrictive firearm legislation states was modeled by averaging the 10 most-restrictive states with their bordering states. All states were then re-ranked based on the new Border Adjustment Score (BAS). FFR were calculated for each quintile and Poisson regression models were created for each score and outcome. Model fit was compared using Aikake information criterion (AIC).

Results: From 2011-2015, there were 169,396 total firearm fatalities including 57,885 firearm homicides (33,158 black, 23,158 white homicides). When top and bottom quintile states for firearm legislation were compared, 65% vs 44% of firearms traced by ATF originated in other states respectively (Figure, % Firearms Recovered). The BAS had a more linear relationship with the overall FFR, all firearm homicide, and both black and white firearm homicide as gun legislation BAS decreased (Figure, 2011-2015 Border Adjusted). The BAS minimized the AIC with respect to the NBS for black homicide (AIC 4443 vs. 4680) and white homicide (3243 vs. 4319), indicating improved model fit after adjustment for neighboring state firearm legislation.

Conclusion: Our results suggest that firearm movement across state borders plays an important role in firearm homicides. Accounting for firearm legislation in both individual and neighboring states may improve our understanding of the relationship between firearm legislation, homicide and race.





NOTES

Session XXVII: Quickshot II - 14-26
Paper 26: 11:42-11:48 am

IMPACT OF LICENSED FEDERAL FIREARM SUPPLIERS ON FIREARM-RELATED MORTALITY

Stephanie Chao* MD, Zachary Kastenberg MD, Sriraman Madhavan BS, Kristan Staudenmayer* MD, MS Stanford University

Invited Discussant: Sherry Sixta, MD

Introduction: Legal firearm sales occur largely through suppliers that have Federal Firearm Licensees (FFLs). These include a wide range of distributors, such as gun stores and pawnshops. Since FFL density might reflect ease-of-access to firearm purchases, we hypothesized that the number of FFL dealers would be associated with firearm-related deaths. We further hypothesized that licensee-type subsets would be associated with differential risks for gun-related deaths.

Methods: We used data from the National Center for Health Statistics National Vital Statistics System (2008-2014) and national data on Federal Firearms Licensees available through the Bureau of Alcohol, Tobacco, Firearms and Explosives for 2014. FFL density was determined by normalizing FLL license number by population. Correlation analysis and linear regression analysis were performed to determine the relationship between different licensee types and firearm-related deaths. We controlled for population, number of statewide registered firearms, and the density of other types of FFLs.

Results: We identified a total of 65,297 FFLs in 2014. There was a moderate correlation ($R = 0.53$, $\rho = 0.48$) between total FFL density and firearm-related death rates. Further analysis by type of firearm-related death showed a strong correlation ($R = 0.81$, $\rho = 0.76$) between total FFL density and firearm-related suicide rates. No correlation was found between total FFL density and firearm-related homicide rate.

Among individual FFL types, FFL02 (firearm dealing pawnshop) density was the only FFL-type found to be correlated with
firearm-related death rates. We found a strong correlation between FFL02 density and overall firearm-related death rate ($R = 0.69$, $\rho = 0.78$) and firearm-related suicide rate ($R = 0.72$, $\rho = 0.78$) (Figure 1).

Linear regression analysis showed that even while controlling for number of registered firearms and population, the number of
firearm-dealing pawnshops remained significantly associated with overall firearm-related deaths and firearm-related suicides. Linear regression results show an incremental 4.23 gun-related deaths for each additional firearm-dealing pawnbroker per state over the study period.

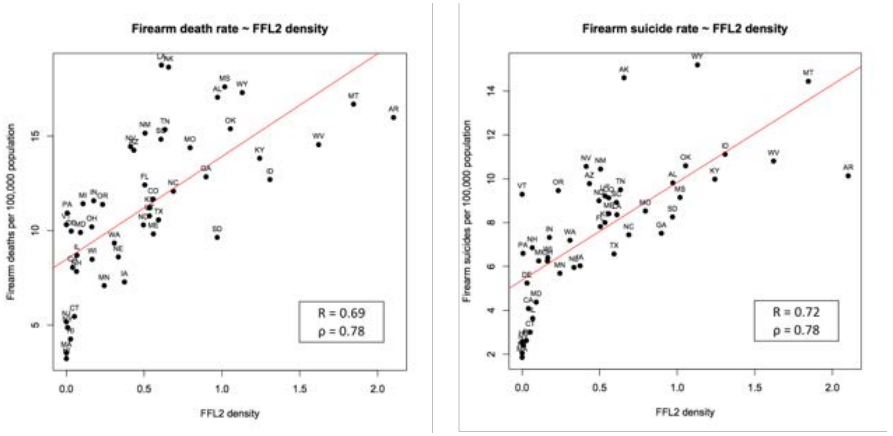


Figure 1: Firearm dealing pawnshop density vs. Firearm death rate and Firearm suicide rate

Conclusion: Access to legally-distributed firearms is associated with firearm-related death rates, particularly firearm-related suicides. There was no association with firearm-related homicides. Furthermore, firearm-dealing pawn shops were associated with suicide-related deaths. These findings suggest that deeper exploration of legal firearm access and firearm-related injuries would benefit discussion of preventative measures.

NOTES

POSTERS

Poster # 1

Failure to Rescue and the Weekend Effect: A Study of a Statewide Trauma System

Catherine E. Sharoky MD, Morgan M. Sellers MD, Elinore J. Kaufman MD, MSHP, Yanlan Huang MS, Wei Yang Ph.D., Rachel R. Kelz MD, MSCE, Patrick M. Reilly* MD, Daniel N. Holena* MD, MSCE University of Pennsylvania

Introduction: Differential patient outcomes based on weekday or weekend patient presentation (i.e. the "weekend effect") have been reported for several disease states. Failure to rescue (FTR, the probability of death after a complication) has been used to evaluate trauma care. We sought to determine whether the weekend effect impacts FTR across a mature statewide trauma system.

Methods: We examined all 30 Level I and II trauma centers using the Pennsylvania Trauma Outcomes Study (PTOS) from 2007-2015. Patients age >16y with a minimum Abbreviated Injury Score 2 were included; burn patients and transfers were excluded. Our primary exposure was first major complication timing (weekday vs weekend), FTR was the primary outcome. We used multivariable logistic regression to examine the association between weekend complication occurrence and mortality.

Results: Of 178,602 patients, 15,304 had a major complication [median age 58 (IQR 37-77) years, 68% male, 89% blunt injury mechanism, median injury severity score (ISS) 19 (IQR 10-29)]. Patient characteristics by complication timing were clinically similar (Table). Major complications were more likely on weekdays than weekends (9.3% vs 7.1%, $p<0.001$). Pulmonary and cardiac complications were most common in both groups (Table). Death occurred in 2,495 of 15,304 patients with complications, for an overall FTR rate of 16.3%. Weekday vs weekend FTR was similar (16.1% vs 16.8%; $p=0.33$). After controlling for patient age, ISS, complication type, and revised trauma score (RTS), there was no association between weekend complication occurrence and mortality (adjusted OR 1.03, 95% CI 0.92-1.16).

Table. Patient Characteristics by Weekday vs Weekend Timing of Major Complication

Variable	Weekday N=11,251	Weekend N=4,053	P-Value*
Age, y, median (IQR)	58 (37-77)	57 (36-77)	0.11
Sex, male, No. (%)	7,658 (68.1)	2,787 (68.8)	0.42
Race, white, No. (%)	8,787 (78.1)	3,116 (76.9)	0.01
Blunt Injury Mechanism, No. (%)	10,038 (89.2)	3,571 (88.1)	0.06
Injury Severity Score, median (IQR)	19 (10-29)	19 (10-29)	0.55
Revised Trauma Score, median (IQR)	7.8 (6.9-7.8)	7.8 (6.9-7.8)	0.62
Complication Day Post-Admission, median (IQR)	3 (1-6)	3 (1-5)	<0.01
Complication Type, No. (%)			
Pulmonary	4,606 (40.9)	1,627 (40.1)	0.38
Cardiac	2,397 (21.3)	919 (22.7)	0.07
Bleeding or Clotting	363 (3.2)	139 (3.4)	0.54
Infectious	648 (5.8)	259 (6.4)	0.15
Iatrogenic	1,527 (13.6)	490 (12.1)	0.02
Other	1,710 (15.2)	619 (15.3)	0.91
Failure to Rescue (FTR), No. (%)	**1,814 (16.1)**	**681 (16.8)**	**0.33**

*Mann-Whitney U test for continuous variables, Chi-squared test for categorical variables

Conclusions: The ability for trauma centers to rescue patients from death after a complication is not impacted by weekday or weekend complication timing. Requirements for trauma centers to be operational with full staffing at all times likely counteracts the weekend effect phenomenon seen in other time-sensitive conditions. Restructuring staffing for management of other conditions to mimic the 24/7 trauma care model may improve outcomes.

Poster # 2

EVALUATION OF HELICOPTER TRANSPORT OF TRUAMA PATIENTS IN A RURAL STATE: HAVE WE GONE TOO FAR?

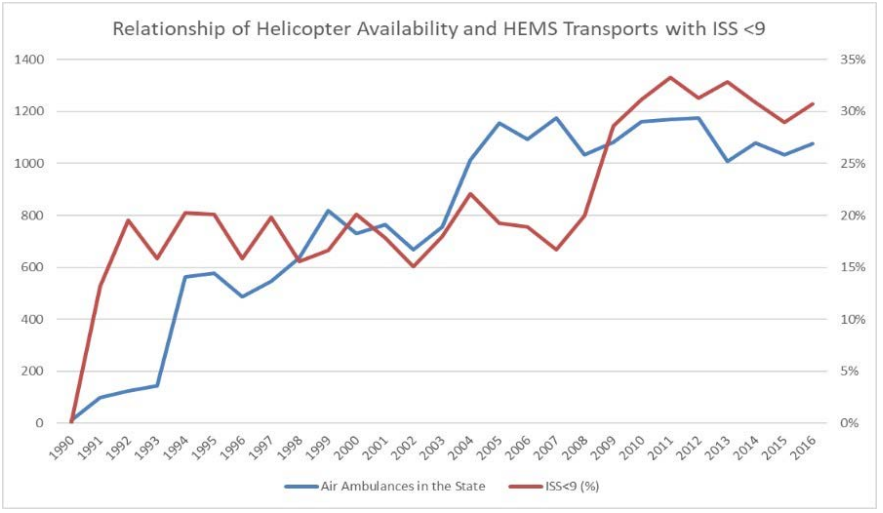
Lauren M. Dudas MD, Amy Tefft MD, Steven Talbert Ph.D., Daniel Davenport Ph.D., Marlene J. Broady Andrew C. Bernard* MD, University of Kentucky

Introduction: Helicopter emergency medical services (HEMS) overtriage increases the cost of trauma care. Private HEMS expansion could increase overtriage. We sought to determine whether increased utilization of HEMS in our rural state is associated with overtriage.

Methods: A retrospective analysis of all trauma patients transported to an ACS verified Level I trauma center via helicopter over a 26 year period (1990-2016) was performed using data from the trauma registry. HEMS overtriage was defined as one or more of the following: LOS <2 days, disposition from the ED other than ICU or OR, ISS <9.

Results: 21,177 HEMS patients were transported to our center. Annual helicopter transports increased dramatically from 1990 (11) to 2016 (1076). Overall overtriage rate was 57.3%. Overtriage doubled from 2007 to 2009, which corresponds to an increase in air ambulances in the state within the same time period from 8 to 23. The counties with the highest percent of patients transported who met overtriage criteria had the furthest distance to the trauma center. Scene HEMS transports had greater overtriage rates than interfacility transfers. Patients with LEG AIS scores <2 were more likely to be transferred from the scene, 18.8% versus 11.9% ($p<0.001$) compared to interfacility transfers which had higher rate of facial AIS scores <2, 6.9% versus 4.4% from scene ($p<0.001$).

Conclusion: There was a near doubling of overtriaged HEMS patients in our rural state from 2007-2009, at which time there was also a tripling of air ambulances. This suggests an increase in HEMS is likely secondary to an increased number of available helicopters and not an increase in injury severity. Our data also demonstrate that a higher percentage of patients who met overtriage criteria were transferred from the scene. However, patterns of injury were different when comparing scene versus interfacility transports.



Poster # 3

DOES THE TIME OF THE DAY OF SURGERY INFLUENCE PERIOPERATIVE COMPLICATIONS – A NATIONWIDE DATABASE ANALYSIS IN 31'692 PATIENTS

Sascha Halvachizadeh MD, Hans-Christoph Pape* MD, FACS, Valentin Neuhaus MD, PD University Hospital Zurich

Introduction:Emergency and surgery for acute injuries is often required to avoid excessive bleeding and prevent from infections in open fractures. However, it has previously been discussed, that surgeon related factors (e.g. experience of the surgeon, teaching vs. non-teaching hospital) might play a role in adverse outcomes for these surgeries. The purpose of this study was to evaluate whether the time of day for emergent surgery is associated with complications.

Methods: A prospective database (AQC, nationwide Swiss quality assurance project) was used to evaluate all trauma surgeries within 11 years in more than 70 Swiss surgical units. Inclusion criteria: All trauma coded diagnosis that were surgically treated in Swiss hospitals. Exclusion criteria: missing data for time of surgery. The daytime of surgery was stratified into morning (7AM - noon), afternoon (1PM – 6PM), evening (7PM – 11PM) and night (Midnight – 6AM). The primary outcomes were intraoperative (e.g., nerve, tendon, or vascular damage, iatrogenic fractures), postoperative (e.g., bleeding, infection, impaired wound healing, incorrect axial, rotational or length reduction) and general complications (pulmonary, cardiovascular, gastrointestinal, renal, or neurological) and mortality. Co-factors included age, gender, ASA classification, type of surgery, experience of the surgeon, length of surgery and length of stay). Variables were sought in bivariable and multivariate anylysis.

Results: Of 31'692 patients, 44% were operated in the morning, 40% in the afternoon, 14% in the evening and 1.7% at night. The in-hospital mortality rate was significantly higher after nightly (2.4%) as well as afternoon surgery (1.7%). The time of surgery had no significant influence on intra- (0.5%) or postoperative complication rates (3.4%) in multivariable analysis, but a significant influence on general complications (7.9%). Afternoon- and night-surgery were significant predictors for general complications. Age, gender, higher ASA classification, and emergency procedures were typical risk factors for mortality and complications in this cohort.

Conclusion: Emergency procedures performed at night and in the afternoon appears to be associated with an increased incidence of adverse outcomes. Further studies should evaluate whether this is relevant for certain diagnoses and/or procedures.

Poster # 4

THE PROGNOSTIC VALUE OF NATIONAL FIELD TRAUMA TRIAGE GUIDELINES IN INJURED OLDER ADULTS AND DEVELOPMENT OF THE GERIATRIC FIELD TRAUMA TRIAGE (GFTT) SCORE

Tabitha Garwe MPH,Ph.D., Kenneth Stewart MPH,Ph.D., Julie A. Stoner Ph.D., Craig D. Newgard MD,MPH, John C. Sacra MD, Patrick Cody DO,MPH, Babawale O. Oluborode MPH, MBBS, Jason S. Lees* MD, Roxie M. Albrecht* MD, University of Oklahoma Health Science Center

Introduction: The Field Triage Decision Scheme developed by the American College of Surgeons Committee on Trauma (ASCOT) with periodic revision forms the basis of field triage guidelines for injured adult patients in many regions including Oklahoma. The decision scheme has been shown to have low sensitivity for seriously injured *older* patients. Proposed alternative criteria for injured older adults has been shown to improve sensitivity at the expense of specificity (over-triage). We sought to develop two prognostic tools with improved sensitivity and specificity to identify seriously injured older adults including those at a high risk of in-hospital mortality in the prehospital or in a resource-limited setting based on, current national field triage guidelines, previously proposed alternative criteria, and other potential risk factors such as pre-existing comorbidity.

Methods: This was a retrospective cohort study of injured adults >=55 years transported directly from the scene of injury by EMS to a trauma facility for definitive care and reported to the Oklahoma State Trauma Registry between 2005 and 2014. Patient demographics, pre-existing comorbidity, variables used to define the current national field trauma triage guidelines as well as variables proposed by other investigators for alternative triage criteria were considered. The primary outcome of interest was serious injury, defined as an Injury Severity Score (ISS) >=16. In-hospital mortality was considered as a secondary outcome. Based on the two prognostic models, we developed the Geriatric Field Trauma Triage (GFTT) score to summarize identified significant risk markers/factors for the outcomes of interest. Logistic regression was used for multivariable modeling, and bootstrapping with resampling was used to adjust the prognostic models for overfitting and regression-to-the-mean bias.

Results: A total of 13275 patients met study eligibility. Of these, 28.5% (3782) had an ISS >=16 (serious injury) and 9.8% (1300) died. The final models for predicting both serious injury and in-hospital mortality included the following variables: demographic, mechanism of injury, modified physiologic criteria, anatomic injury criteria and specific comorbid conditions (cardiac disease and coagulopathy). At the optimal GFTT scores where sensitivity and specificity are maximized, the prognostic model for serious injury (AUC, 0.86; 95%CI 0.86-0.87) outperforms current triage guidelines, sensitivity (87.4% vs 76%) with minimal loss in specificity (74% vs 78%); and the model for in-hospital mortality (AUC, 0.82; 95%CI 0.80-0.83) shows reasonable accuracy (73.4% sensitivity and 74% specificity). When stratified into low, moderate and high risk groups using recursive partitioning analysis, patients in the highest risk category had 83% and 42% predicted probability of serious injury and in-hospital mortality respectively.

Conclusion: Identification of high-risk injured older adults in the prehospital or resource-limited setting could be improved by considering other variables such as age group, pre-existing comorbidity, and modified physiologic criteria without loss in specificity. Use of risk scores may be used to simplify the prehospital triage process, enhance compliance with the triage guidelines, and reduce under-triage in the injured older adult.

Poster # 5

Leaving the frail behind: the role of frailty in trauma triage of the elderly

Barbara Haas MD,Ph.D., Priscila Pequeno MSc, Hannah Wunsch MD, MSc, Raquel Duchen MPH, RD, Camilla Wong MD, MHSc, Lesley Gotlib Conn Ph.D., Damon Scales MD,Ph.D., Avery B. Nathens* MD,Ph.D., University of Toronto, Department of Surgery

Introduction: Older adults with severe injuries are less likely to be triaged from the scene of injury to trauma center care. Secondary triage at non-trauma centers allows those older adults to be transferred to a trauma center for definitive care. Although physiologic and anatomic critiera have traditionally been used to guide secondary triage, these factors may not identify older adults at highest risk for adverse outcomes. Frailty is a geriatric syndrome that represents a loss of physiologic reserve and is associated with increased mortality and morbidity in trauma patients. In this study, we evaluated the impact of frailty on transfer to trauma center care among older adults.

Methods: We performed a population-based, retrospective cohort study that evaluated triage patterns for older adults in a large regional trauma system over 2006-2016. All patients aged ≥ 65 with severe injury (ISS > 15 or death within 48 hours of injury) were included. For patients initially triaged from the field to a non-trauma center, we evaluated the relationship between frailty and subsequent transfer to a trauma center. Generalized estimating equations were used to adjust for patient and injury factors associated with transfer.

Results: We identified 21,499 patients aged ≥ 65 with severe injuries. One quarter of patients were frail. 77% of patients were triaged from the field to a non-trauma center. Of these patients, only 23% were transferred to a trauma center. Among those transferred, 18% were frail, compared to 30% who remained at a non-trauma center (Table 1). Adjusting for patient and injury variables, frailty was independently associated with decreased probability of transfer (OR 0.87, 95% CI 0.76-0.99) and with death (OR 1.32, 95% CI 1.21-1.44).

Conclusion: Despite being a strong predictor of adverse outcomes among older adults with severe injuries, frailty was associated with a lower rate of transfer to trauma center care. These data suggest that variables pertinent to the outcomes of older adults should be incorporated into transfer guidelines.

Table 1: Characteristics of patients triaged to a non-trauma center

	Admitted to NTC	Transferred to TC	SD
	N=12,628	N=3,872	
Mean age	81.6 ± 8.2	77.7 ± 7.8	0.48
Female (%)	7,006 (55.5%)	1,621 (41.9%)	0.27
History of CHF (%)	678 (5.4%)	125 (3.2%)	0.11
History of AMI (%)	279 (2.2%)	75 (1.9%)	0.02
History of stroke (%)	415 (3.3%)	92 (2.4%)	0.05
History of diabetes (%)	4,157 (32.9%)	1,240 (32.0%)	0.02
History of dementia (%)	3,124 (24.7%)	586 (15.1%)	0.24
Frailty (%)	3,837 (30.4%)	715 (18.5%)	0.28
Admitted from LTC (%)	937 (7.4%)	109 (2.8%)	0.21

Abbreviations: NTC: non-trauma center; TC: trauma center; SD: standardized difference; CHF: congestive heart failure; AMI: acute myocardial infarction; LTC: long-term care

Poster #6

IMPLEMENTATION OF A TRAUMA RE-ORGANIZATION INITIATIVE TO IMPROVE TRAUMA CARE AND TEAM DYNAMICS IN A LEVEL I TRAUMA CENTER

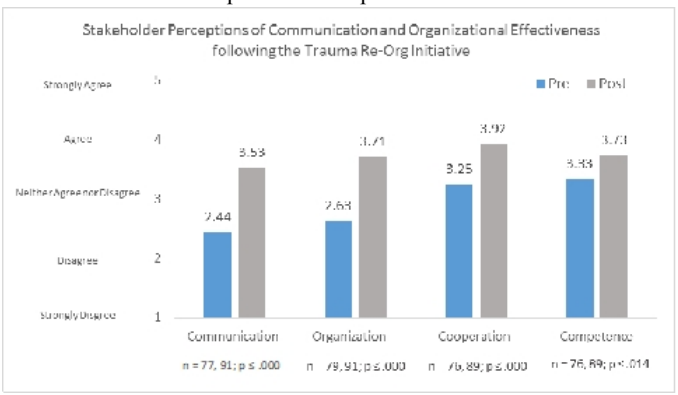
Ming-Li Wang MD, Daniell Albright Ph.D., Isaac Tawil MD, Sonlee West* MD,
University of New Mexico

Introduction: Good teamwork and collaboration among multi-disciplinary and multi-professional trauma team members has been known to improve timeliness of patient disposition and management. While few would disagree that these qualities are important, achieving and maintaining functional trauma response teams requires work. The Trauma Re-Organization Initiative (Trauma Re-Org) was collaboratively developed between the Departments of Emergency Medicine (EM) and Trauma Surgery at a Level 1 Trauma Center to improve communication, teamwork, and the management of trauma patients in the emergency department (ED).

Methods: Trauma Re-Org was launched in January 2017 after a 9 month planning process. The planning team was comprised of faculty and residents from both departments and ED nursing. The group reviewed and modified a protocol that designated the roles and responsibilities for all personnel and designed the initiative didactic and simulation training activities. Prior to the launch, planners also conducted a series of "listening tours" with key stakeholder groups which included faculty, residents, and nursing leadership. The initiative was supported by a formative process evaluation that included observation of planning and training events, a survey of trauma response stakeholders, and post-implementation observations of trauma response in the ED.

Results: The Stakeholder survey included responses from EM physicians, trauma surgeons, and ED nurses (Pre N = 79; Post N = 91). Mann-Whitney U tests showed positive and significant change in the post period for overall communication, organization, and cooperation between personnel during trauma response, and improved perceptions of the clinical skill competence of other responders. The analysis also showed specific improvements for communication between EM attending physicians and nurses with trauma surgery residents. In addition, trauma surgeons reported improved communication with ED staff. Open-ended questions identified both achievements and areas for continuing improvement, including: improved but imperfect communication, further need for role clarification, and support for the designation of an identifiable trauma team leader.

Conclusions: A multi-faceted trauma improvement program that includes a number of interventions, including organizing roles, organizing responsibilities within team framework, in situ simulations, team building exercises, and the inclusion of stakeholder perspectives can re-build a culture of cooperation, collaboration, and an overall increase in the belief that one's contribution is valued. The initiative is easily adaptable to other trauma centers that have practitioners from various disciplines who want to optimize teamwork and collaboration to improve trauma patient care.



Poster # 7

COMPARISON OF SIMPLIFIED TRAUMA SCORES TO PREDICT MORTALITY AT A SUB-SAHARAN TERTIARY REFERRAL CENTER

Rebecca Maine MD,MPH, Jared Gallaher MD,MPH, Nidia Rodriguez-Ormaza MD,MPH, Malcolm Jefferson BS,MPH, Chifundo Kajombo BS, MB, Carlos Varela BS, MB, Trista Reid MD,MPH, Anthony Charles* MD,MPH, University of North Carolina

Introduction: Injury severity scoring systems are often utilized to predict injury outcomes but usually require diagnostic adjuncts and imaging that are often unavailable in resource-limited settings. Several simplified scores have been developed for trauma prediction, including the Malawi Trauma Score (MTS), which includes age, sex, AVPU neurologic status (A-Alert, V-Voice, P-Pain and U-Unresponsive), presence of a palpable radial pulse and body area injured; the Kampala Trauma Score (KTS), which uses APVU, age, respiratory rate (RR), systolic blood pressure (SBP) and number of serious injuries; and the Revised Trauma Score (RTS), which uses Glascow Coma Scale (GCS), SBP and RR. While these scores have each shown predictive power in different low-resource setting, their performance has not been compared in the same population.

Methods: A trauma surveillance registry from a tertiary referral hospital in sub-Saharan Africa was analyzed using patients seen between 2010 through 2014. We used logistic regression and generated ROC curves, using each of the three scoring systems for patients. We then compared the performance of each score in predicting mortality. Secondary analysis evaluated each scoring system's ability to predict hospital admission.

Results: A total of 62,425 patients were included in the trauma registry during that time; 1,120 (1.8%) died while in the ED or hospital, and 10,954 (17.6%) were admitted to the hospital. Sufficient information was available to calculate the MTS for 26,829 patients, the KTS for 22,127, and the RTS for 21,831. The MTS predicted mortality (ROC AUC= 0.813) better than KTS and RTS (ROC AUC = 0.711 and 0.683 respectively) (Figure 1). The KTS and RTS curves did not differ statistically (p= 0.75), however, the MTS curve, discriminated better than either KTS or RTS (p <0.001, both). For admissions, KTS performed best, but prediction was low overall (AUC= 0.575) (Figure 2).

Figure 1: Prediction of mortality by MTS, KTS and RTS

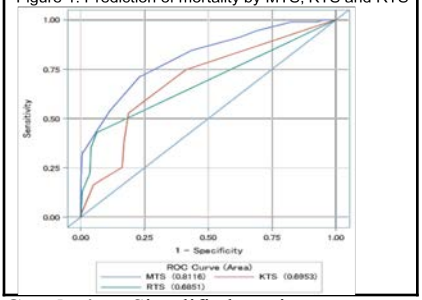
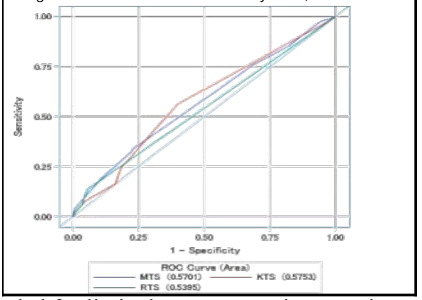


Figure 2: Prediction of admission by MTS, KTS and RTS



Conclusion: Simplified scoring systems are needed for limited-resource settings to triage patients appropriately and to allocate scarce resources. The MTS predicted mortality better than KTS or RTS. The MTS also requires no equipment, not even a sphygmomanometer, nor does it rely on subjective assessment of injury severity, as the KTS does. Future work to compare these scores in varied populations, and in prehospital triage, is imperative.

Poster # 8

OUTCOMES WITH ADVANCED VERSUS BASIC LIFE SUPPORT IN BLUNT TRAUMA

Michael S. Farrell MD, MBS, Benjamin Emery Richard Caplan Ph.D., John Getchell RN, Kevin M. Bradley* MD, Christianacare Health Services

Introduction: The role of advanced life support (ALS) versus basic life support (BLS) in blunt trauma is controversial. Previous studies have shown no mortality benefit for penetrating trauma, particularly in urban environments, with ALS over BLS. The distinction for blunt trauma in an urban/suburban environment has mostly remained unaddressed.

Methods: A retrospective cohort study was conducted in patients transported to a Level 1 trauma center in an urban/suburban environment. Adult blunt trauma patients transported by ALS and BLS from July 1, 2014 to December 31, 2014, were identified. Institutional trauma records were used to assess Injury Severity Score (ISS) and select Abbreviated Injury Score (AIS). Logistic regression was used to determine differences in mortality, length of stay (LOS) and in-hospital complications based on mode of transportation, time of transport, and number of interventions performed pre-hospital.

Results: 698 total patients were identified, 67.8% were transported by ALS. ALS patients grossly had higher rates of mortality ($p=0.01$) and complications ($p=0.009$). However, ALS patients did have a higher ISS ($p < 0.001$) and when adjusted for ISS and AIS, there was no difference between patients transported by ALS and BLS with respect to mortality (ISS: $p = 0.47$, AIS: head, thorax, abdomen $p=0.6$-0.8). There was no difference between ALS and BLS for time of transport ($p=0.61$) or LOS ($p=1.35$). After adjusting for ISS, the number of interventions performed in the field did not increase transport time ($p=0.46$) but did correlate with increased mortality ($p<0.001$).

Conclusion: When accounting for injury severity, there is no mortality advantage for patients being transported by ALS versus BLS transport. The number of interventions performed did not alter transport time, but did influence mortality. This suggests that ALS transport may not be necessary in blunt traumas and increased interventions may be detrimental to patient outcomes.

Poster # 9

BACK TO THE FUTURE: IMPACT OF A PAPER-BASED ADMISSION H&P ON CLINICAL DOCUMENTATION IMPROVEMENT AT A LEVEL 1 TRAUMA CENTER

Jordan A. WEINBERG* MD, Kristina M. Chapple Ph.D., Ronald A. Gagliano Jr., MD, Jordan V. Jacobs MD, Sharjeel Israr MD, Scott R. Petersen* MD, St. Joseph's Hospital And Medical Center

Introduction: Case Mix Index (CMI), calculated from patient MS-DRG-weights determined from clinical documentation (CD), is a standard indicator of patient complexity and determines reimbursement for inpatient care. CD language, however, is not aligned with physician language, resulting in potential for CMI under-representative of true patient complexity and severity of illness. We postulated that returning to a paper-based admission form (H&P) that included a "picklist" of standard admission diagnoses in CD language would improve CD at our trauma center. The purpose of this study was to determine the impact of this practice change with regards to the change in CMI.

Methods: Consecutive inpatient discharges from our trauma service from October-December 2016 were deemed EHR cohort and May-November 2017 PAPER cohort. Excluded cases included discharge dates during the period of transition to paper-based charting between January and April 2017. Cases with DRG-weights greater than 10, relatively unaffected by documentation, were excluded given their propensity to skew CMI. MS-DRG weight, length of stay (LOS), Injury Severity Score (ISS), and expected reimbursement were recorded for each patient. CMI calculated as the average of MS-DRG-weights was determined for each cohort.

Results: Our cohort consisted of 218 (29%) EHR and 535 (71%) PAPER records coded using MS-DRG version 34. There were not significant differences between groups in hospital length of stay (LOS; $P = 0.966$) or Injury Severity Score (ISS; $P = 0.350$). CMI and expected payment were significantly higher in the PAPER cohort (CMI: 2.3 ± 1.7 vs. 2.6 ± 1.9, $P = 0.001$; expected payment \$24,599 ± 29,593 vs. \$18,520 ± 19,553, $P < 0.001$). Regression modeling determined PAPER cohort was associated with average increase in CMI of 0.30 (adjusted for ISS and LOS), resulting in an average increase of 11.1% in expected reimbursement per patient.

Conclusion: A paper-based H&P form at a level-1 trauma center was associated with an increase in CMI and expected reimbursement. This simple approach provided physicians with the ability to choose diagnoses that align with CD language, resulting in CD improvement. H&P forms with "picklist" diagnoses should be considered by trauma centers to more accurately document the relative complexity of their inpatient populations.

Poster # 10

WOULD PRE-HOSPITAL WHOLE BLOOD TRANSFUSION IMPROVE MORTALITY IN SEVERELY INJURED PATIENTS?

Caroline Zhu Danielle Cobb MD, Rachelle Jonas RN, Meenakshi Rani Ph.D., Tracy Cotner-Pouncy RN, Jenny Oliver RN, Andrew Cap* MD, Ramon Cestero* MD, Susannah Nicholson MD, Brian Eastridge* MD, Donald Jenkins* MD, University of Texas Health Science Center at San Antonio

Introduction: Hemorrhage is the most common cause of preventable death in trauma patients, with approximately 40% of trauma deaths attributed to uncontrolled blood loss, and up to half of these deaths taking place before the patient arrives at the hospital. These mortalities might be prevented with pre-hospital transfusion. The goal of this analysis was to characterize injured patients requiring massive transfusion to determine the potential impact of a pre-hospital whole blood transfusio

Methods: Using our level I trauma center's registry, we retrospectively identified all adult trauma patients from January 2015 to August 2017 requiring activation of the massive transfusion protocol (MTP). Patient demographics, Emergency Medical Services (EMS) times, vital signs [systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), shock index [HR/SBP (SI)], pulse pressure divided by heart rate (PP/HR), mean arterial pressure (MAP), and PP] and injury severity scores (ISS) were evaluated by the independent samples t-test and chi-square test to assess for differences between survivors and non-survivors.

Results: Our study population of 124 MTP patients had the characteristics shown in Tables 1 and 2. The all-cause mortality was 73% (90/124) with 84% (76/90) of deaths due to bleeding. Of the hemorrhage-related deaths, 57% (43/76) spent less than or equal to 30 minutes in the pre-hospital setting. The odds of death were higher for both elderly patients (age ≥55 years) and for blunt trauma compared to penetrating, [1.22 (95% CI, 0.99 – 1.50 and 0.94 – 1.58 respectively)]. Positive predictive value (PPV) of death for patients with PP<45 and SI>1 was 0.79 for all patients, but was 0.81 and 0.92 for blunt injury and elderly patients, respectively.

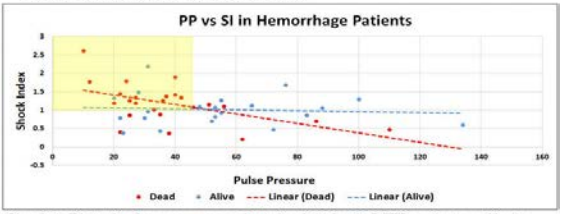
Conclusion: Our data demonstrate a high mortality rate in trauma patients who require MTP, with a mortality trend in older patients and patients with blunt trauma. We recommend using EMS pulse pressure in combination with either shock index or systolic blood pressure to serve as a trigger for initiation of pre-hospital whole blood transfusion. This study supports the development and implementation of a pre-hospital whole blood transfusion program. Realizing that most hemorrhage-related deaths had less than a 30-minute pre-hospital time, transfusion initiated by EMS may decrease mortality in the MTP patient.

	Total	Dead	Alive	p-value
# of Patients	124	90 (73%)	34 (27%)	
# of Blunt Injury	83 (67%)	64 (71%)	19 (56%)	0.108
# of Penetrating Injury	41 (33%)	26 (29%)	15 (44%)	
Age	42 (18-87)	43 (18-87)	37 (19-83)	0.115
ISS	30	34	20	<0.001
EMS SBP	78	74	88	0.222
EMS DBP	45	45	45	0.984
EMS HR	97.1	93.4	106.1	0.112
EMS SI	1.15	1.18	1.11	0.514
EMS PP	33.0	29.1	43.0	0.022
EMS MAP	56.1	54.8	59.3	0.587
EMS PP/HR	0.37	0.34	0.44	0.166
EMS Time (in minutes)	40.1	42.2	34.7	0.605

Table 1. Characteristics of MTP patients (reported as means unless otherwise noted). ISS is significantly higher and PP is significantly lower in the group that died.

Positive Predictive Value of Death					
PP<45	SI>1	SBP ≤110	SBP ≤110 and SI>1	PP<45 and SI>1	SBP ≤110 and PP<45
0.78	0.71	0.73	0.73	0.79	0.79

Table 2. PPVs of death in MTP patients. "PP<45 and SI>1" and "SBP≤110 and PP<45" are highly predictive of death.



Graph 1. Plot of pulse pressure against shock index in MTP patients suffering primarily from hemorrhage. PP<45 appears to be correlated with death.

Poster # 11

HEAD INJURY ALERT: A NEW LEVEL OF TRAUMA ACTIVATION AT COMMUNITY HOSPITALS?

Daniel Ricaurte MD, Daniel Slack MD, Aaron Gilson DO, Michael Nowicki MD, Monika Nelson RN, Peter Zdankiewicz MD, Waterbury Hospital

Introduction: Trauma activation at a hospital requires mobilization of significant resources and personnel. The trauma team, operating room, CT scan and X-ray technologists all have to be available to assist at short notice. While Level 1 trauma centers are better equipped to designate personnel and resources to trauma activations, community hospitals tend to be more limited in their capacity to allocate resources to the trauma patient. In 2014, the Committee on Trauma of the American College of Surgery issued the updated Orange Book with its latest recommendations for optimal care of the injured patient. Amongst trauma activation criteria was included elderly patients that sustain falls from any height on anticoagulation. Based on our experience with this specific trauma population, we hypothesized that a new tier of trauma activation composed of a limited trauma team could preserve patient safety while reducing time and cost.

Methods: A "Head Injury Alert" was created to denote patients with a GCS > 14 who had fallen from a height of <20 feet while on anticoagulation. The team, composed of an ED attending, a surgical resident and one nurse, triage and evaluate the patient with the goal of obtaining a CT scan of the head within 30minutes of presentation. At any time, the Head Injury team could raise the level of trauma activation if deemed necessary. Data was prospectively acquired utilizing the Electronic Medical Record at our institution for all head trauma activations from its inception in June 2017 to January 2018. Data collected included patient age, type of anticoagulation, Injury Severity Score (ISS), time from arrival to CT scan, outcomes, missed injuries, disposition (admission vs discharge) and number of activations requiring escalation of care.

Results: From June 1st 2017 to January 31st 2018, 150 head injury activations occurred. 52% of patients were female while 48% were male. The median age was 77 years old. The most common anticoagulant observed was Coumadin, corresponding to 28% of all patients. 46% of patients were discharged to home from the emergency room, while 43% were admitted and 7% required admission to the intensive care unit. The median time-to-CT was 26 minutes, with 45 out of 152 CT scans delayed more than 30minutes. The ISS ranged from 0 to 25, with the worst ISS seen in patients taking ticagrelor. Eleven patients (7.3%) presented with positive head CT, but only one underwent neurosurgical intervention. Of the 5 deaths, three patients (2%) succumbed to intracranial hemorrhage, one to pneumonia present on admission and one to cardiac arrest which led to his fall.

	Patients	Patient Percentage	Median Age	Head CT Time	Length of stay (days)	Admission to ICU (%)	Admit to Medicine (%)	Admit to Surgery (%)	Discharges (%)	Death (%)	ISS
Brilinta	1	0.67	56	24	1	100	0	0	0	0	5
Coumadin	43	28.67	82	27.4	2.45	4.65	37.2	11.63	46.51	2.33	1.76
Eliquis	32	21.33	77.5	26.7	1.88	6.25	43.75	3.13	46.88	0	0.9
Heparin SQ	1	0.67	91	21	2	0	0	0	100	0	0
Lovenox	3	2	60	21.3	1.83	0	66.7	0	33.3	0	2
Plavix	40	26.66	79	27.5	1.76	12.5	30	5	50	7.5	2.6
Pradaxa	6	4	79.5	26.2	0.92	0	16.67	0	83.33	0	0
Xarelto	18	12	72	31.8	1.72	5.56	55.56	5.56	33.33	5.56	1.83
Coumadin/Lovenox	2	1.33	72.5	39.5	4.25	0	50	0	50	0	0
Coumadin/Plavix	2	1.33	66	35	3.25	0	50	0	50	0	0
Plavix/Eliquis	1	0.67	73	14	0.5	0	0	0	100	0	0
Plavix/Xarelto	1	0.67	87	27	3	0	100	0	0	0	4
Total	150	100									

Conclusion: Head Injury Alert can be safely applied as a new level of trauma activation for patients that fall from <20 feet while on anticoagulation. This new level of activation helps identify a specific patient population and injury mechanism that can be safely triaged by a limited trauma team. With this, community hospitals can maximize their resources and minimize cost, while maintaining patient safety.

Poster # 12

FALL DOWNS SHOULD NOT FALL OUT -- BLUNT CEREBROVASCULAR INJURY AND ITS SEQUELAE ARE COMMON IN GERIATRIC PATIENTS FOLLOWING LOW ENERGY BLUNT TRAUMA

Erika Flashburg DO, Forrest B. Fernandez MD, Alison Muller Sara Wilhelm PA-C, Jared Zavilla PA-C, Laura Castor PA-C, Alicia Sherwood PA-C, Shayne Layser PA-C, Spencer C. Barbera BS, Reid A. Reinhart BS, Adrian W. Ong* MD, Reading hospital

Introduction: Blunt cerebrovascular injuries (BCVI) are associated with specific injuries to the face, skull base and cervical spine. There are limited studies examining the impact of screening protocols for BCVI in geriatric patients after low energy falls. We hypothesized that BCVI screening in this cohort would rarely identify injuries and would infrequently result in a change in management.

Methods: A retrospective study was conducted over a 36-month period (2014-2016) of patients ≥ 18 years with Abbreviated Injury Scores for the head, neck or face region of ≥2. Patients were defined as meeting criteria for BCVI screening if any of these anatomic criteria were present: diffuse axonal injury, C1-3 fracture, any cervical subluxation or fractures involving foramina transversaria, Leforte 2 or 3, petrous temporal bone or bilateral mandibular fractures. Outcomes were in-hospital mortality and stroke in the 30-day period following presentation. Univariate analysis was used where appropriate with a p value of 0.05 indicating statistical significance.

Results: 303 patients met criteria for BCVI screening with 141 (47%) being ≥65 years. Patients were screened with computed tomographic angiography (94%) and magnetic resonance angiography (6%). 120 (85%) sustained falls, of which 58 (48%) underwent screening. Screened patients were younger (mean age 78 vs 82, p=0.02), less likely to have serum creatinine of > 1.5 mg/dl (14% vs 29%, p=0.04) but had similar AIS- head and neck scores (median, 3 vs 3, p=0.8). Mortality was similar for those with and without screening (7% vs 16%, p=0.2). Of the 62 patients not screened, 38 (61%) were already on antithrombotic agents and another 12 (20%) died from severe traumatic brain injuries or had cardiac arrest shortly after arrival. Of the 58 screened patients, 17 (29%) had BCVI. Four (24%) of the 17 BCVI patients had strokes compared with one (2%) of 41 without BCVI (p=0.01). Seven of the 17 (41%) BCVI patients had antithrombotic agents started. Mortality rates were similar for patients with and without BCVI (12% vs 5%, p=0.3).

Conclusion: In geriatric patients with falls who had screening for BCVI, the yield was high and management changes common. BCVI was associated with stroke. Screening seems warranted in this cohort when prognosis after trauma is not bleak.

Poster # 13

INFUSED CEREBRAL NOREPINEPHRINE EXACERBATES NEUROLOGIC DEFICITS FOLLOWING REPEAT TRAUMATIC BRAIN INJURY

Galinos Barmparas MD, Navpreet K. Dhillon MD, Noell Cho BS, Mor Alkaslasi BS, Joshua Ghoulian BS, Nikhil T. Linaval Gretchen M. Thomsen Ph.D., Eric J. Ley* MD, Cedars-Sinai Medical Center

Introduction: Catecholamine levels surge immediately after acute traumatic brain injury (TBI), often to levels reflecting the severity of injury, causing inflammation and apoptosis. The degree of catecholamine surge following mild repetitive TBI (rTBI) and its relationship to the injury sequela is unknown. We hypothesized that mild repetitive TBI (rTBI), causes increased basal norepinephrine (NE) levels over time and artificially elevated NE is associated with further functional impairments in a rat rTBI model.

Methods: Fifty-six wild type rats were administered sham, or rTBI once per week for 5 weeks. NE levels were measured on the day prior to injury 1, 2 and 3. One week following the last injury, animals received ventricular infusion of vehicle or NE (0.4 μg/hour) for 6 weeks. Rats were tested on the rotarod, the open field, Barnes Maze, and Basso, Beattie, and Bresnahan (BBB) analysis to determine changes in neurologic function.

Results: rTBI led to increased basal NE levels over the time course of injury, relative to sham. No rotarod or open field differences were observed in TBI rats administered NE compared to vehicle. However, after rTBI NE administration resulted in impairments in short-term working memory. Cerebral NE infusion after rTBI led to lower BBB scores, indicating mild paralysis and impaired locomotion (Figure 1). The infusion of NE to sham rats did not alter BBB scores.

Conclusion: After mild recurrent TBI, elevated NE may lead to secondary brain injury and additional functional deficits. Mitigation of an excess catecholamine response, possibly with beta blockers, might therefore be essential for ameliorating the long-term morbidity associated with rTBI.

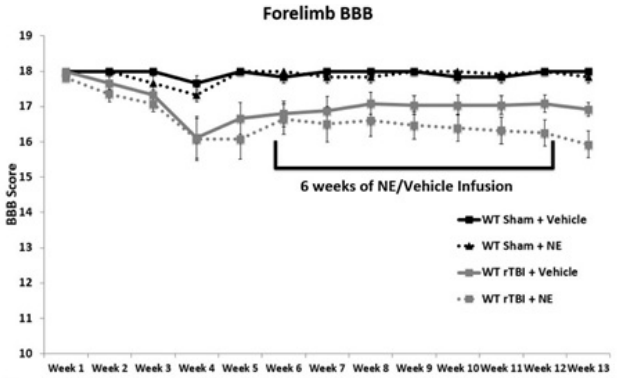


Figure 1. rTBI rats administered intracerebroventricular (ICV) infusion of norepinephrine (NE) developed worse paralysis and impaired locomotion.

Poster # 14

ASSOCIATION OF EARLY MORTALITY AND ELEVATED SHOCK INDEX AT ADMISSION IN PATIENTS WITH TBI AND CONCOMITANT HEMORRHAGHIC SHOCK: A POST-HOC ANALYSIS OF THE PROHS STUDY

Matthew C. Hernandez MD, Martin A. Schreiber* MD, Deborah Stein* MD,MPH, Michael Goodman* MD, Jeffrey D. Kerby*
MD,Ph.D., Kenji Inaba* MD, Eileen Bulger* MD, Erin E. Fox Ph.D., Johnathon M. Aho MD,Ph.D., John Holcomb* MD, Charles E.
Wade Ph.D., Martin D. Zielinski* MD, Mayo Clinic - Rochester

Introduction: Rapid and effective treatment of hemorrhagic shock (HS) is important for critically injured patients with traumatic brain injury (TBI) in order to reduce secondary brain injury. The shock index (SI) rapidly assesses hypovolemic shock severity which can complicate TBI. The Prehospital Resuscitation on Helicopter Study (PROHS) assessed the impact of blood product resuscitation during prehospital air transport for severely injured patients. Utilizing the PROHS database, we evaluated whether elevated SI at admission impacted mortality in TBI-HS and TBI +HS patients. We hypothesized that a normal SI on admission was associated with improved patient mortality.

Methods: A post-hoc analysis of the multi-center PROHS study was performed. PROHS inclusion criteria were: heart rate > 120 bpm, systolic blood pressure ≤90 mmHg, penetrating truncal injury, tourniquet/pelvic binder application, intubation or receipt of blood product during air prehospital transport.Patients with TBI (head abbreviated injury scale ≥3), prehospital HS (base excess ≤ -6 or a pulse pressure <45 mmHg) and/or receiving a massive transfusion (critical administration threshold; CAT: at least three units of RBCs given in any one-hour interval during first 24 hours after ED admission) were identified. SI was calculated for prehospital and admission time points with SI normalization defined as a prehospital SI value >0.9 improving to 0.4-0.89 at admission. Comparison of patient mortality (3, 24 hours and 30 days) between TBI-HS and TBI+HS groups was performed. Logistic regression was used to evaluate prehospital factors associated with 24 hour mortality using odds ratios (OR) with 95% confidence intervals (95% CI).

Results: A total of 396 patients were analyzed; 192 TBI+HS (48%) and 204 TBI-HS (52%). **Table** demonstrates injury severity, fluid resuscitation, and coagulation parameters for each group. Notably at admission, TBI+HS patients had a higher ISS, likelihood of receiving blood products, and coagulopathy than patients with TBI-HS. CAT rates were dissimilar in TBI+HS and TBI-HS groups (43%vs 30% respectively, p=.03). The proportion of uncorrected SI (≥ 0.9) at admission was higher in TBI + HS (60%) compared to TBI-HS (29%). Within the TBI-HS group, patients with admission SI <0.9 demonstrated lower mortality compared to those with a SI ≥0.9 at three (0% vs 8.3%, p=.002) and 24 hours (6.7% vs 16%, p=.03). In the TBI+HS group, patients with admission SI <0.9 demonstrated lower mortality compared to those with a SI ≥0.9 at three (5.6% vs 23.1%, p=.002) and at 24 hours (14.1% vs 36.4%, p=0.001). On regression, factors independently associated with 24 hour mortality in both groups included penetrating injury (OR 6.7 95% 2.6-11.5), increasing age (OR 1.03 95% CI 1.01-1.05 per year), ISS (1.04 95% CI 1.01-1.1 per ISS unit), a lack of normalized admission SI (OR 2.4 95% CI 1.1-5.6) and the presence of coagulopathy at admission (OR 4 95% CI 2-8.5).

Conclusions: Patients with TBI+HS demonstrated increased mortality compared to TBI-HS at 3 and 24 hours but not at 30 days. TBI+HS patients also demonstrated concomitant coagulopathy by INR but not on thromboelastography compared to TBI-HS. At admission, SI that improved with treatment was associated with a reduction in mortality despite age, injury mechanism, or injury severity for both groups. Further analysis evaluating SI to improve pre-hospital resuscitation in patients with TBI+HS is warranted.

	TBI N=204	TBI + HS N=192	P value
Age in years	35 [24-57]	41 [26-57]	.77
ISS	26 [19-33]	28 [22-36]	.007
Prehospital SI > 0.9 (%)	20	54	0.001
Admission SI > 0.9 (%)	29	60	0.001
Crystalloid (cc)	300 [0-750]	375[0-1000]	.85
Blood utilized (%)	6.9	17.2	.001
R time	1.3 [0.7-3]	0.9 [0.7-4]	0.54
MA	61 [55-67]	63 [53-68]	0.32
Coagulopathy (%)	39.1	55.1	.001
INR	1.1 [1.1-1.2]	1.3 [1.1-1.5]	.026
Lactate	2.5 [1.6-3.6]	3.3 [2.4-6.1]	.0001
Hemoglobin	13.4 [12-14.6]	12.6 [10.8-13.8]	.0001
Mortality (%)			
3 hour	3.9	16.7	.0001
24 hour	13.2	28.1	.0003
30 day	29.4	37.5	.09

Poster # 15

A NOVEL LABORATORY RAT MODEL OF FOCUSED BLAST WAVE-INDUCED MILD TRAUMATIC BRAIN INJURY

Hiroshi Matsuura MD, Mitsuo Ohnishi MD,Ph.D., Sanae Hosomi MD, Takeshi Shimazu* MD,Ph.D., Osaka University Graduate School of Medicine

Introduction: Mild blast-induced TBI (mbTBI) is a quite common combat injury, and the number of victims with mbTBI is increasing worldwide due to terrorism. Thus, the mechanism of and treatment for blast injury must be understood. This study aimed to establish a rat model of mbTBI to assess chronic disability including immunohistological changes in the brain and discover clues for intervention.

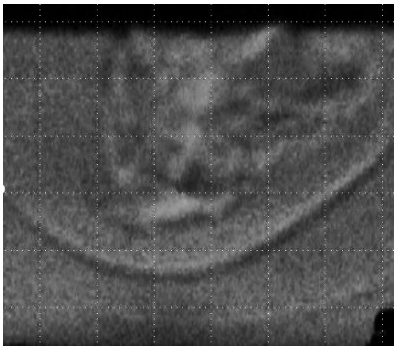
Methods: We built and used a blast wave generator described by Jaffin et al. (1987). The blast wave exited through a 20-mm I.D. nozzle aimed at the target. Rat brains showed no detectable injury at a nozzle-to-brain distance determined by preliminary testing (n=5). Peak shock wave pressure measured (93.7±10.2 psi) at 2.5 cm under the nozzle. The blast wave was directed at the head of male SLC:Wistar rats weighing 247±3.9 g under general anesthesia positioned prone 2.5 cm below the nozzle. Blast wave-induced brain injury was evaluated by Iba1 immunoreactivity at 3 days and 1, 2, and 6 weeks after injury. A forced swim test was performed 2 and 6 weeks after injury to assess depressive-like behavior.

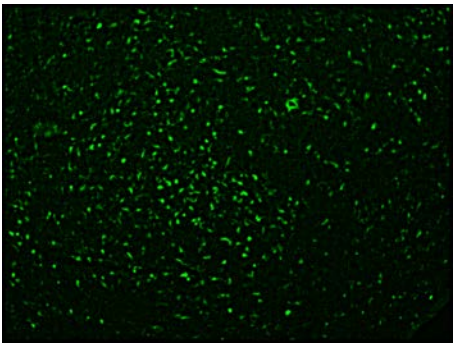
Results: The mbTBI rat model showed no macroscopic findings of brain hemorrhage or contusion after blast injury, and behavioral changes appeared unchanged from the control group. However, early post-injury food intake decreased significantly in the blast group rats (day 1: 4.7 vs. 16.7 g/day; day 2: 11.3 vs. 18.7 g/day, n=3) and they lost weight compared to control (-18 vs. +10 g on day 3; P=0.001, n=11 vs. 3). The blast group showed increased immobility time in the forced swim test at 2 weeks (165 s vs. 125 s; n=6) and at 6 weeks (199 s vs. 162 s; n=6). Iba1 immunostaining show microglial accumulation in the hypothalamus at 2 weeks after injury and also in the thalamus and brain stem at 6 weeks.

Conclusions: This novel mbTBI rat model showed chronic-phase immunohistological abnormality and depressive-like behavior indicating that chronic traumatic encephalopathy by mbTBI may cause mental state change. This model will allow more precise identification of the mechanism of and best treatment method for mbTBI.

(Left) Shock wave from the generator.

(Right) Microglial accumulation in hypothalamus at 6 weeks.





Poster # 16

MANAGING CRANIOMAXILLOFACIAL INJURY WITHOUT ROUTINE INPATIENT CONSULTATION: OUTCOME REVIEW AND REDUCTION IN PATIENT CHARGES

Georgina Alizo MD, Leeda Roshan Keely Muertos MPH, Jason D. Sciarretta* MD,
University Of South Carolina/Grand Strand Medical Center

Introduction: Traumatic craniomaxillofacial (CMF) injuries are commonly assessed by the trauma team and refer consultation to otolaryngologist or oral maxillofacial specialist. We hypothesized that trauma surgeons can safely selectively manage CMF injuries identified on computed tomographic (CT) scans without specialized surgical services, thereby decreasing the overall cost burden to patients.

Methods: We performed a retrospective analysis of all traumatic CMF fractures diagnosed on facial CT scan at a Level 1 trauma center during a 3-year period (January 2013 to December 2015). Those requiring CMF consultation were determined by the following injuries: lower midface, upper midface, and the craniobasal-facial unit. Patient population then categorized to those with CMF consultation versus no-CMF consultation. Patient age, sex, Glascow Coma Scale (GCS) score, and Injury Severity Score (ISS) recorded. Specialty consultation charges were also calculated for review. All penetrating injuries, skull fractures or any patient completing inpatient craniofacial surgery were excluded from the analysis.

Results: 303 patients with CMF fractures on CT met inclusion criteria (124 [41%] CMF consultation versus 179 [59%] no-CMF consultation). Mean age was 47.8 ± 19.7 years (range, 5 to 94 years), and 70% males. Mean GCS and ISS was 13± 3.4 (3-15) and 10 ± 9 (1-66) respectively. Patients with CMF consults were more likely to have higher ISS ($p<0.001$) and need surgery on admission ($p<0.001$), while those with no-CMF consult had shorter LOS ($p<0.002$). No in-hospital mortality or 30-day readmission rates were related to no-CMF consult. Those with CMF consultation, only 18.5% had inpatient consult follow up and 31 (22 patients [17.7%]) inpatient surgical procedures (18% ENT vs 52% OMFS) by surgical specialist. Of the accepted transfers (7 of 11) for isolated CMF injuries, a mean of 1.5 days length of stay was observed and no required surgical interventions recorded. Total patient charges saved with no-CMF consultation was $26,539.96 during this review.

Conclusion: Trauma surgeons can selectively manage acute CMF injuries without inpatient specialist consultation. Additional guidelines can be established to avoid tertiary transfers to tertiary center for specialty consultation and decrease patient charges.

Patient Demographics	Total (n=303)	Consult (n=124)	No Consult (n=179)	P-value
Age, mean ± SD	47.8 ± 19.7 (5-94)	50.6 ± 20.1 (17-94)	45.9 ± 19.3 (5-89)	**0.039**
Male, *n* (%)	209 (69.0)	82 (66.1)	127 (70.9)	0.372
Transfer In, *n* (%)	11 (3.6)	4 (3.2)	7 (3.9)	0.570
ISS, mean ± SD	10.0 ± 9.0 (1-66)	12.8 ± 9.5 (1-66)	8.0 ± 8.1 (1-45)	**< 0.001**
GCS, mean	13.5 ± 3.4 (3-15)	13.1 ± 3.9 (3-15)	13.7 ± 3.1 (3-15)	0.160
LOC, *n* (%)	176 (58.1)	75 (60.5)	101 (56.4)	0.481
Inpatient surgery, *n* (%)	24 (7.9)	24 (19.4)	0 (0.0)	**< 0.001**
Outpatient surgery, *n* (%)	3 (1.0)	3 (2.4)	0 (0.0)	0.068
LOS, mean ± SD	6.6 ± 9.6 (0-52)	8.7 ± 11.4 (0-52)	4.7 ± 7.2 (0-46)	**0.002**
ICU Admit, *n* (%)	87 (28.7)	48 (38.7)	39 (21.8)	**0.001**
ICU LOS, mean ± SD	7.9 ± 8.0 (1-42)	9.4 ± 8.2 (1-42)	6.1 ± 7.5 (1-37)	0.057
Died, *n* (%)	13 (4.3)	4 (3.2)	9 (5.0)	0.570

Poster # 17

PREDICTORS OF CONCURRENT CERVICAL SPINE FRACTURES IN PATIENTS WITH DIAGNOSED INTRACRANIAL HEMORRHAGE

Cecily E. DuPree DO, MBS, Jason D. Sciarretta* MD, Keely Muertos MPH, Christoph Kaufmann MD, Grand Strand Medical Center

Introduction: Cervical spine fractures (CSF) have long been assumed present in high proportions of patients with a primary diagnosis of intracranial hemorrhage (ICH) due to the magnitude of injury required to cause ICH. However, the risk due to mechanism of injury (MOI) is unclear to suggest if additional computed tomography (CT) imaging is required. We hypothesize that the incidence of concurrent CSF injury with ICH is low based on MOI, and over utilization of CT scans has increased radiation burden and hospital cost.

Methods: A 2-year retrospective review was conducted for all patients admitted at a Level 1 trauma center sustaining blunt injury. Demographic data, radiographic imaging, GCS, ISS, length of stay (LOS), and ethanol levels were analyzed. To evaluate blunt impact trauma, patients were categorized as low or high impact mechanisms, by either fall (low) or motor vehicle collision (MVC - high); our facilities two most commonly treated MOI. Patients were further reviewed for isolated or combined ICH/CSF injury. The diagnostic yield of CT scans for clinically significant injury was then calculated.

Results: 3,222 patients were reviewed, and 861 identified with ICH or CSF. Patients were divided into three injury groups: CSF only, ICH only, or combination injury (CI). MOI was evaluated within injury groups and compared. Median age was 55 ± 23 years (range, 20-103) and 65% male. Incidence of CI was 3.0% (26 of 861) in the fall and MVC study groups. Mean GCS and ISS was 15 (3-15) and 5 (1-50), respectively. Fall patients with ICH were less likely to have CSF compared to fall patients with a negative head CT ($p>0.001$). Increased age, higher ethanol concentration ($p = 0.030$), higher ISS, and lower GCS were positive predictive factors in CI fall patients ($p<0.001$). These factors were also similar for CI MVC group (ethanol $p = 0.035$; ISS, GCS $p < 0.001$). MVC patients were 5.9 times more likely to have CI ($p < 0.001$). Patients with an isolated CSF due to fall were 2.0 times more likely to have a C2 vertebra injury compared to patients with an isolated CSF due to MVC ($p = 0.049$). Patients who sustained an isolated CSF due to MVC were 4.0 times more likely to have a C7 vertebra injury compared to patients with CSF due to fall ($p < 0.001$). There were no significant differences in location of cervical spine fracture between CI groups.

Conclusion: Fall patients with ICH have low incidence of concomitant CSF, and fall as an MOI does not have a significant positive predictive value for cervical spine injury. Existing guidelines for cervical spine clearance should be followed to limit unnecessary additional radiographic imaging thereby decreasing the radiation exposure and cost burden to the patient.

Table 1: Patient Demographic Comparison for the Identification of Predictors

	Fall Combined injury (n = 7)	Fall ICH (n = 340)	Fall CSF (n =101)	p-value	MVC Combined injury (n = 19)	MVC ICH (n = 90)	MVC CSF (n =53)	p-value
Age, mean ± SD (range)	75.4 ± 12.9 (56 – 86)	70.2 ± 17.2 (0.3 - 94)	67.5 ± 18.3 (20-103)	**< 0.001**	45.8 ± 23.1 (18-91)	45.5 ± 23.7 (0.1 -86)	51.7 ± 20.4 (15-90)	**0.003**
Male, *n* (%)	4 (57.1)	184 (54.1)	57 (56.4)	0.911	11 (57.9)	53 (58.9)	30 (56.6)	0.965
ETOH ≥ 0.08, *n* (%)	3 (42.9)	40 (11.8)	17 (16.8)	**0.030**	8 (42.1)	15 (16.7)	15 (28.3)	**0.035**
ISS, mean ± SD (range)	12.9 ± 6.7 (5-21)	14.8 ± 7.5 (1-41)	9.7 ± 4.9 (4-25)	**< 0.001**	19.4 ± 9.2 (5-45)	21.2 ± 11.5 (4-66)	13.0 ± 7.2 (4-29)	**<0.001**
Arrival GCS, mean ± SD (range)	11.5 ± 5.7 (3-15)	13.4 ± 3.3 (3-15)	14.1 ± 2.8 (3-15)	**< 0.001**	10.1 ± 5.7 (3-15)	10.7 ± 5.3 (3-15)	14.6 ± 1.4 (6-15)	**< 0.001**
LOS, mean ± SD (range)	12.4 ± 7.3 (2-23)	8.1 ± 9.1 (1-79)	7.4 ± 7.3 (1-41)	**< 0.001**	21.4 ± 18.6 (2-80)	16.5 ± 23.3 (1-142)	10.5 ± 11.8 (1-60)	**< 0.001**
ICU admission, *n* (%)	6 (85.7)	265 (77.9)	39 (38.6)	**< 0.001**	17 (89.5)	79 (87.8)	28 (52.8)	**< 0.001**
ICU LOS, mean ± SD (range)	8.5 ± 4.6 (2-14)	5.0 ± 5.9 (1-40)	5.3 ± 5.8 (1-24)	**< 0.001**	12.1 ± 9.2 (1-30)	9.2 ± 10.9 (1-49)	11.1 ±10.9 (1-42)	0.522
Ventilator required, *n* (%)	3 (42.9)	70 (20.6)	14 (13.9)	0.093	8 (42.1)	39 (43.3)	9 (17.0)	**0.005**
Vent days, mean ± SD (range)	6.0 ± 3.6 (2-9)	7.8 ± 7.4 (1-35)	8.2 ± 6.8 (1-21)	0.891	15.8 ± 7.1 (7-27)	13.6 ± 14.8 (1-74)	18.4 ± 9.9 (6-36)	0.177
Survived, *n* (%)	6 (85.7)	311 (91.5)	96 (95.0)	0.407	17 (89.5)	81 (90.0)	51 (96.2)	0.380

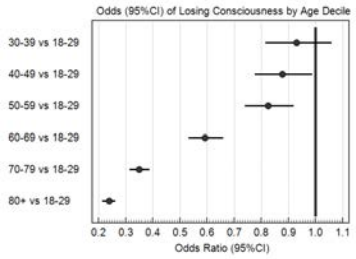
Poster # 18

IS AGE PROTECTIVE OF LOSING CONSCIOUSNESS AFTER CONCUSSION: WHAT CAN 35,000 MILD TRAUMATIC BRAIN INJURIES TELL US?

Alessandro Orlando MPH, Benjamin Rubin MD, David Bar-Or MD, Swedish Medical Center

Introduction: Aging is significantly associated with decreasing volume of brain parenchyma and increasing volume of cerebrospinal fluid (CSF). One role of CSF is to protect the brain from forces caused by head trauma. Moreover, the mechanism by which loss of consciousness (LOC) occurs after a head injury is not well defined but must somehow be attributable to the forces experienced by the brain. Thus, it is possible that age-related increases in CSF volume will protect against losing consciousness after a TBI. The primary objective of this study was to examine to what extent age is associated with a change in the risk of LOC after sustaining a concussion in the setting of mild TBI (mTBI, Glasgow coma scale [GCS] 13-15). Our secondary objective was to generate hypotheses to help direct future research on this topic.

Methods: This was a retrospective observational study utilizing six years of National Trauma Data Bank data. We included patients with 1) diagnosis of concussion; 2) positive or negative affirmation of post-injury LOC; 3) age ≥18 years; 4) had a "fall" mechanism of injury; and 5) with an initial Glasgow coma scale 13-15. We excluded patients with skull fractures or diagnoses of intracranial hemorrhage. Age groups were analyzed continuously, and categorically by decade (starting at 18-29 and ending at ≥80). The primary outcome was a reported LOC vs. a reported lack of LOC (ICD-9 850.1-850.5 vs. 850.0). Chi-square tests were used to assess differences in proportions between outcome groups, and multivariable logistic regression examined independent predictors of LOC. All statistical tests were two-tailed with an alpha of 0.05.



Results: There were 35,577 patients included in our study. The overall rate of LOC was 78.7% (n=27,990). The median (IQR) age in patients with a LOC was 55 yrs (40-70), and in those without LOC was 69 (52-81). There was a significant decrease in the odds of LOC with increasing age decile (Figure 1). The most pronounced decrease in odds of LOC started after age 50-59 yrs. (Figure 1). There was no significant difference in the odds of LOC between patients aged 18-29 vs. 30-39 yrs. Patients aged ≥80 yrs. had a 76% decrease in the odds of having a LOC, compared to patients aged 18-29 (OR=0.24, 95%CI [0.21–0.26]). When age was analyzed as a continuous predictor, each 10-year increase in age was associated with a 23% reduction in the odds of suffering a LOC (OR=0.77, 95%CI [0.76–0.78]).

Conclusion: These nationwide data suggest a strong inverse association between age and odds of LOC, in a select population with concussion and mTBI. Furthermore, our data are in agreement with multiple quantitative CT studies suggesting that age-related cerebral atrophy begins to accelerate at age 50-55. It is possible that increased CSF volume mitigates sheer-related diffuse axonal injury and the likelihood of LOC. It is also possible that increased CSF volume helps to dissipate rotational and acceleration forces on the brainstem, reducing their affects on the reticular activating system and thus reducing the likelihood of LOC. These notable results offer a opportunity to generate important hypotheses to examine in smaller clinical studies.

Poster # 19

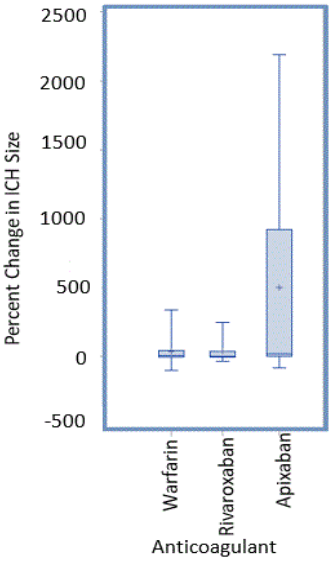
AN ANALYSIS OF OUTCOMES AFTER ADMINISTRATION OF KCENTRA FOR URGENT REVERSAL OF ANTICOAGULATION IN PATIENTS WITH INTRACRANIAL HEMORRHAGE

Michael S. Farrell MD, MBS, Matthew Painter MD, Richard J. Caplan Ph.D., Michael Morton-Wiedner MD, Michael Perza PharmD, Mark Cipolle* MD,Ph.D., Christianacare Health Services

Introduction: Intracranial hemorrhage (ICH) is presenting with increasing incidence in anticoagulated patients. Kcentra is currently recommended for urgent reversal of vitamin K antagonist (VKA) anticoagulation. While Kcentra is being used for urgent reversal of Xa inhibitor (XaI) mediated anticoagulation, the data to support this is limited and focused on relatively healthy patients with small ICHs. These studies do recognize an accepted 30 day mortality risk of approx
imately 6% and an associated thromboembolic event rate of approximately 4%. We evaluated the effectiveness and outcomes of utilizing Kcentra to urgently reverse anticoagulation in patients with ICH.

Methods: A retrospective observation study of anticoagulated patients at a single institution who received Kcentra between September 2013 and December 2016 for ICH was completed. The primary endpoint was change in ICH size between initial and repeat head CT in patients who did not have an intervening cranial procedure. Secondary endpoints included: mortality, discharge disposition, and thromboembolism development.

Results: 110 ICH patients received Kcentra (31.8% traumatic). Three anticoagulation groups were analyzed: warfarin (n=75), rivaroxaban (n=21), and apixaban (n=14). No significant differences were noted with respect to median ICH size at initial (p=0.88) or repeat (p=0.48) head CT or in median percent change (p=0.71) (Figure 1). There was no difference among groups in the number of patients in which ICH volume either increased or decreased by 20% (p=0.75). Approximately half of all patients died during their hospital course with a median life expectancy of 3 days. Of those who survived there was no difference in discharge disposition between groups with 60-80% of those who survived requiring further nursing care (p=0.99). Overall, requiring a drainage procedure was not associated with increased mortality (p=0.55). Rates of thromboembolic complications, resulting in 2 deaths, were noted in 13.3% of VKA patients, but 0% of XaI patients.



Conclusion: In patients given Kcentra for warfarin and rivaroxaban, ICH size does not change significantly. The median ICH size increased in apixaban but this was not significantly different due to wide variability and limited sample size. Mortality rates were higher in all groups than previously reported though not higher for any specific anticoagulant or in patients requiring a drainage procedure. Thromboembolic complications were seen in the warfarin group and were directly related to Kcentra administration.

Poster # 20

ANTIBIOTICS FOR DRAINS AFTER TRAUMATIC SPINE INSTRUMENTATION ARE NOT PROPHYLACTIC OR THERAPEUTIC

David J. Skarupa* MD, Firas G. Madbak* MD, David J. Ebler MD, Albert T. Hsu MD, Don W. Johnson Pharm D, Gazanfar Rahmathulla MD, Andrew J. Kerwin* MD, Marie L. Crandall* MD,MPH, University of Florida, Jacksonville

Introduction: Antibiotics after spine instrumentation are often extended while the surgical drain is in place without strong evidence. Patients with traumatic spine injuries are considered a higher risk population. The recommendations to continue antibiotics after instrumentation in this group of patients is undefined. Judicious use of antibiotics is important for a myriad of reasons and is under investigation. Some current studies in elective spine surgery patients have shown no benefit to continuing antibiotics beyond 24 hours even if a surgical drain is in place. We sought to study if continuing antibiotics past 24 hours after traumatic spine instrumentation when a surgical drain is placed in a county safety net hospital impacted outcomes.

Methods: We performed a retrospective observational study of all patients who underwent spine fixation with hardware and surgical drains for traumatic injury at our Level I Trauma Center between 1/1/14 and 12/31/17. Routine demographic and injury variables were obtained to determine the effect of perioperative (≤ 24 hours of antibiotics) versus prolonged (>24 hours) antibiotics on surgical site infections (SSI), mortality, hospital length of stay (HLOS), and intensive care unit length of stay (ICU LOS). Bivariate and multivariable logistic and linear regression statistics were performed.

Results: Three hundred forty-six patients were included in the analysis. On multivariate analysis, antibiotic duration longer than 24 hours did NOT predict surgical site infection (SSI) (OR 2.68, 95% CI 0.88-8.10, p=0.08), death (OR 0.59, 95% CI 0.10-3.44, p=0.56), HLOS (p=0.13), or ICU LOS (p=0.37), when controlling for age, gender, mechanism of injury, spinal cord injury, and insurance status.

Conclusion: Continuing antibiotics past 24 hours, even if a surgical drain is left in place, after traumatic spine instrumentation is not necessary. Prolonged antibiotics are not inferior to standard perioperative antibiotics. A prospective study that could control for potential confounders such as race and comorbidities may be warranted.

Table 1. Bivariate Statistics

	Perioperative Antibiotics (≤24 hours) (n=194)	Prolonged Antibiotics (>24 hours) (n=152)	p-value
Age	45 . 6 ± 17.3	49.5 ± 16.4	0.98
Sex			
Male	151	109	0.15
Female	43	43	
Insurance			
Commercial & Medicare	148	122	0.42
Medicaid & self-pay	45	30	
ISS	20.5 ± 15.3	22.5 ± 15.5	0.88
Shock Index	1.5 ± 0.5	1.5 ± 0.5	0.5
GCS	13.8 ± 3	14 ± 2.6	0.74
Mechanism			
Blunt	192	150	0.81
Penetrating	2	2	
Spinal cord injury			
Yes	124	93	0.66
No	70	58	
SSI			
No	186	141	0.07
Yes	5	10	
Hospital LOS	16.1 ± 15.9	19.4 ± 16.9	0.9
ICU LOS	11.8 ± 12	13.7 ± 14.4	0.9
Death			
Lived	189	150	0.59
Died	4	2	

Poster # 21

PROLONGED PARTIAL RESUSCITATIVE ENDOVASCULAR BALLOON OCCLUSION OF THE AORTA (pREBOA) IS SAFE IN A SEVERE HEMORRHAGIC SHOCK MODEL, IN THE ABSENCE OF TRAUMATIC BRAIN INJURY

Aaron M. Williams MD, Umar F. Bhatti MD, Isabel S. Dennahy MD, Vahagn C. Nikolian MD, Panpan Chang MD, Kiril Chtraklin DVM, Rachel O'Connell Nathan Graham Jessica Lee Jing Zhou MD, Patrick E. Georgoff MD, Ben E. Biesterveld MD, Yongqing Li MD,Ph.D., Jonathan L. Eliason MD, Hasan B. Alam* MD, University of Michigan

Introduction: The use of partial REBOA (pREBOA) in combined hemorrhagic shock (HS) and traumatic brain injury (TBI) has not been well studied. We hypothesized that prolonged pREBOA deployment in the setting of concurrent TBI + HS would worsen the clinical outcomes.

Methods: Fifteen female Yorkshire swine were subjected to a combination of 40% total blood volume hemorrhage, computer-controlled cortical TBI, and pREBOA treatment (1 hr). Three groups were studied: HS + TBI (Group 1), HS + TBI + pREBOA (Group 2), and HS + pREBOA (Group 3) (n=5/cohort). After 60 minutes of shock with a mean arterial pressure (MAP) of 30-35 mmHg, Group 1 was left in shock for an additional 60 minutes, whereas Groups 2 and 3 were treated with Zone 1 pREBOA inflation (60 minutes). All animals were then resuscitated with normal saline (NS; 3 x volume of shed blood). Physiologic parameters were monitored for six hours, during which further resuscitation (CVP goal of 6) and vasopressor therapy (MAP goal of 55-60 mmHg) were administered as needed. Brain edema (% increase compared to the uninjured side) and lesion size (mm^3) were quantified at the end of the observation period.

Results: pREBOA deployment resulted in a higher maximal proximal MAP (Group 2, 64.4 ± 11.1 mmHg; Group 3, 66.6 ± 14.7 mmHg; Group 1, 33.4 ± 2.7 mmHg; $p < 0.05$), while maintaining a distal MAP goal of 20-25 mmHg. Mortality was highest in Group 2 (40% vs 0% in the other groups, $p = 0.1$), but no significant differences were noted in the brain edema and lesion size (Group 2, 32.5 ± 6.6%, 3084 ± 619 mm^3; Group 1, 26.5 ± 8.6%, 3107 ± 999 mm^3; $p > 0.05$). Severity of shock was greatest in Group 2 (**Figure 1**). Lactate level at the end of experiment was significantly higher in Group 2 (Group 2, 15 ± 2 mmol/L; Group 3, 2 ± 1 mmol/L; Group 1, 3 ± 2 mmol/L; $p < 0.01$), while pH nadir was significantly lower for Group 2 (Group 2, 7.16 ± 0.04; Group 1, 7.26 ± 0.04; Group 3, 7.31 ± 0.03; $p < 0.01$). In addition, fluid and norepinephrine requirements were significantly higher in Group 2 (Group 2, 3360 ± 706 mL, 0.14 ± 0.02 ug/kg/hr; Group 3, 660 ± 371 mL, 0.014 ± 0.001 ug/kg/hr; Group 1, 300 ± 0 mL, 0 ± 0 ug/kg/hr; $p < 0.01$).

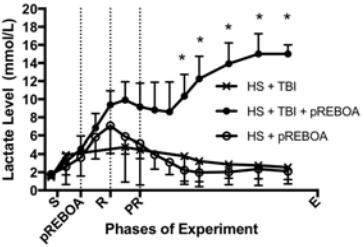


Fig 1. Lactate level over phases of experiment. Data presented as mean ± standard deviation. * designates $p < 0.05$.

Conclusion: Prolonged application of pREBOA for up to an hour is safe in severe HS and does not worsen the extent of TBI. However, the addition of TBI to HS significantly exacerbates the degree of circulatory shock when pREBOA is deployed. Aortic occlusion should be undertaken with extreme caution in the setting of TBI.

Poster # 22

IS INTRA-OPERATIVE REBOA DELAYED REBOA? AN ANALYSIS OF THE AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA AORTA REGISTRY

Michael A. Vella MD, Ryan P. Dumas MD, Megan Brenner* MD, Thomas M. Scalea* MD, Laura J. Moore* MD, Jeanette M. Podbielski RN, CCRP, Kenji Inaba* MD, Scott T. Trexler MD, Sonya Charo-Griego RN, Marshall C. Spalding DO,Ph.D., Charles Fox* MD, Ernest Moore* MD, David Turay MD,Ph.D., Mark J. Seamon* MD, Jeremy W. Cannon* MD, SM AAST AORTA STUDY GROUP

Introduction: Resuscitative endovascular balloon occlusion of the aorta (REBOA) has emerged as a less invasive alternative to open aortic occlusion (AO) in trauma. REBOA is commonly performed in the emergency department (ED), while the role of intra-operative REBOA is less well defined. We hypothesized that delayed insertion until arrival in the operating room (OR) is associated with increased mortality.

Methods: The American Association for the Surgery of Trauma (AAST) AORTA registry prospectively enrolls trauma patients undergoing open and endovascular AO from 29 centers. Patient demographics, admission physiologic variables, and outcome data from this registry were compared between OR and ED REBOA placement. Mann-Whitney U and chi-square analyses were performed where appropriate. Multivariable logistic regression was performed on the outcome of mortality.

Results: Of 321 patients who underwent REBOA, location and timing of insertion were available for 305 (95%). 58 patients underwent OR REBOA (19%) vs. 247 in the ED (81%). There were no differences between populations with respect to sex, lactate, and injury severity score (ISS). Patients who underwent OR REBOA were younger (33 years vs 41 years, p=0.01) and more likely to have a penetrating mechanism (36% vs 15%, p<0.001). There were significant differences with respect to admission physiology (**Table 1**). Unadjusted mortality was lower in the OR group (36.2% vs 68.8%, p<0.001), but there were no differences in transfusion requirements or acute kidney injury. Time from admission to AO was longer in the OR group (75 minutes vs 23 minutes, p<0.001). After controlling for age, admission CPR, systolic blood pressure, heart rate, lactate, ISS, and GCS, there was no association between REBOA insertion location or time to successful AO and mortality.

Conclusions: Nearly one in five REBOAs is placed in the OR, generally in patients who present with more stable initial physiology. In our analysis, delaying REBOA insertion in the appropriate patient until OR arrival was not associated with adverse outcomes.

TABLE 1	Operating Room (OR) REBOA (n= 58)	Emergency Department (ED) REBOA (n= 247)	p-value
Age	32.5[22-51]	40.5[27-58]	**0.01**
Sex			**0.92**
M	44 (75.8%)	189 (76.5%)	
F	14 (24.2%)	58 (23.5%)	
Mechanism			**<0.001**
Penetrating	21 (36.3%)	38 (15.4%)	
Blunt	37 (63.7%)	206 (83.4%)	
ISS	34[25-42]	34[25-45]	**0.38**
SBP	110[80-130]	80[0-111]	**<0.001**
HR	114[92-132]	101[52-129]	**0.04**
GCS	7[3-15]	3[3-9]	**<0.001**
Lactate	6.45[3.9-10.8]	8.2[5.2-12.1]	**0.05**
Prehospital CPR	2 (3.4%)	87 (35.2%)	**<0.001**
Time of occlusion (min)	33[11-67]	30[15-63]	**0.61**
Time from Admission to AO (min)	75[36-110]	23[14-27]	**<0.001**
pRBC (# units)	16[8-28]	12[5-22]	**0.06**
Acute Kidney Injury	10(21%)	47(19%)	**0.75**
Mortality	21 (36.2%)	170 (68.8%)	**<0.001**

Poster # 23

Resuscitative endovascular balloon occlusion of the aorta (REBOA) for severe torso trauma in Japan: A descriptive study

Taku Akashi MD, Kyoungwon Jung MD, Tomohiko Orita MD, Tomohiro Funabiki MD, Motoyasu Yamazaki MD, Mitsuhide Kitano MD, Shokei Matsumoto* MD, Saiseikai Yokohamashi Tobu Hospital

Introduction: Resuscitative endovascular balloon occlusion of the aorta (REBOA) spread early in clinical settings in Japan. REBOA has the potential to be applied as an alternative to the aortic cross-clamp procedure (ACC). The practical indication, usage conditions, and efficacy remain unknown, however. We examined the usage trend of procedures related to aortic occlusion for resuscitation (REBOA and ACC) in Japan for severe torso trauma, and investigated if these procedures were associated with time of death distribution based on a large database from the Japan Trauma Data Bank (JTDB).

Method: The JTDB for 2004 to 2014 was reviewed. Eligible patients were restricted to those with severe torso trauma, which was defined as an Abbreviated Injury Scale (AIS) score of 4 or more for chest, abdomen, or pelvic fracture. Patients were classified into groups according to aortic occlusion procedure: non-procedures, REBOA, and ACC. We classified the clinical situation according to patient blood pressure and primary source of hemorrhage (Figure 1). The primary outcomes were the rates of REBOA and ACC used according to the clinical situation. We also evaluated whether the time of death distributions for the first 8 h differed on the basis of aortic occlusion procedure.

Results: During the study period, a total of 21,533 patients met all of our inclusion criteria. Of those, 611 patients (2.8%) underwent REBOA, and 322 patients (1.5%) underwent ACC. ACC was more frequently used in cases of thoracic injury. Patients with severe hypotension (1-59 mmHg) were more likely to receive REBOA. In contrast, patients with cardiac arrest were more likely to receive ACC (Figure 1). Multiple regression analysis revealed that REBOA (odds ratio [OR]: 5.07, 95% confidence interval [CI]: 4.04-6.36) and ACC (OR: 21.4, 95%CI: 12.8-35.8) were greatly associated with worse outcomes. With respect to the time of death distribution in the first 8 h, the cumulative curve for death in REBOA cases was much more slowly elevated and overtook those of non-aortic procedures around 4 h. It is of note that the cumulative curve for death in REBOA cases was mostly flat for the first 100 min (Figure 2).

Conclusion: The intended purpose of REBOA in Japan is very similar to the current proposed strategy. In addition, it appears that REBOA influences the time of death distribution in the hyper-acute phase, and allows rapid death to be avoided for the first 100 min. Future research on REBOA is needed to investigate its indications and proper use.

Fig. 1 The usage rate of REBOA and ACC

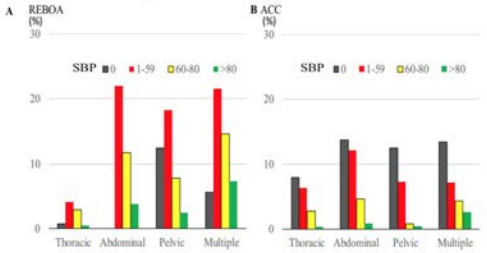
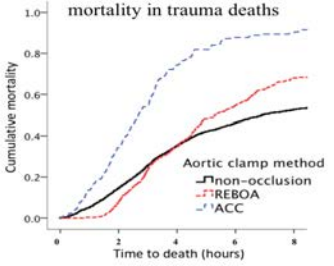


Fig. 2 Time distribution of cumulative mortality in trauma deaths



Poster # 24

AORTIC ZONE 1 REBOA APPLICATION AS AN ADJUNCT TO STANDARD HEMOSTATIC TREATMENT OF LIVER INJURY/HEMORRHAGE IN SWINE

Michael A. Dubick* Ph.D., Dale Prince BS, Amy Polykratis BS, Rodolfo De Guzman Jr., David S. Kauvar MD, Bijan S. Kheirabadi Ph.D., US Army Institute of Surgical Research

Introduction: REBOA is recognized as adjunctive therapy for the temporary control of bleeding from non-compressible torso wounds. For the military it has sparked interest in endovascular approaches to hemorrhage control. The present study evaluated whether REBOA placement in aortic zone I improves standard treatment (packing) of liver hemorrhage in a swine model.

Methods: Anesthetized female swine (50.5 kg) were subjected to a controlled hemorrhage (20 ml/kg), a femur fracture and then to a grade IV/V liver laceration injury (uncontrolled hemorrhage). After a total of 40% blood loss, bleeding was controlled by standard gauze packing of the liver alone (P) or by packing but after placing REBOA in aortic zone I (P +R), n=10/gp. Aortic flow was occluded for 60 min. Five min before release of the balloon, animals in both groups were resuscitated with autologous blood (WB) at 15 ml/kg. A femur fracture only group (n=5) was included as a control. All animals were monitored for 6 hr after liver injury or until death.

Results: Hemorrhage and liver injury reduced MAP ~ 38% in both groups. As expected, REBOA placement raised MAP above baselines, while MAP continued to fall slowly in the P group. Limited resuscitation with WB raised MAP transiently, but it continued to fall toward post-hemorrhage levels during the remainder of the experiment in both groups. Heart rate rose nearly 2-fold in both groups after hemorrhage and remained elevated throughout the experiment. Cardiac output fell about 50% after hemorrhage and tended to be higher in P than P+R after WB resuscitation. Lactate concentration rose nearly 6-fold after hemorrhage and continued to rise in P+R where by the end of the experiment it was over 2-fold higher than in the P group. A similar response was observed for base deficit. Post-treatment blood loss was not different between the two groups. Overall survival was 7/10 in P and 4/10 in P+R with all deaths in P+R occurring after balloon deflation, whereas deaths in the P group occurred within the first hr after injury due to exsanguination. As a result, survival times did not differ significantly between groups. None of these variables changes over time and there were no deaths in the femur fracture only group.

Conclusion: These results suggest that in this model of predominately venous bleeding, full occlusion of the aorta in zone I for 60 min did not improve standard hemostatic treatment of liver injury. Although REBOA appears to delay death due to exsanguination, the ischemia reperfusion injuries associated with its release caused significant hemodynamic and metabolic derangement that were not reversed with limited WB resuscitation in this model. Taken together these data suggest that additional research to modulate the physiologic derangements observed after balloon deflation is warranted as efforts continue to improve the safety of REBOA application, particularly in prolonged care situations.

Poster # 25

AORTIC OCCULSION TIME IS NOT ASSOCIATED WITH INCREASED MORBIDITY OR MORTALITY IN REBOA OR RESUSCITATIVE THORACOTOMY: AN ANALYSIS OF THE AAST AORTA MULTICENTER PROSPECTIVE REGISTRY

Kyle J. Kalkwarf MD, Ronald Chang MD, Megan L. Brenner* MD, Thomas M. Scalea* MD, Kenji Inaba* MD, Scott T. Trexler* MD, Jeremy W. Cannon* MD, M C. Spalding* DO, Charles J. Fox* MD, Ernest E. Moore* MD, David Turay* MD,Ph.D., David J. Skarupa* MD, Joseph A. Ibrahim MD, Laura J. Moore* MD, Joseph J. DuBose* MD, University of Texas Medical School-Houston

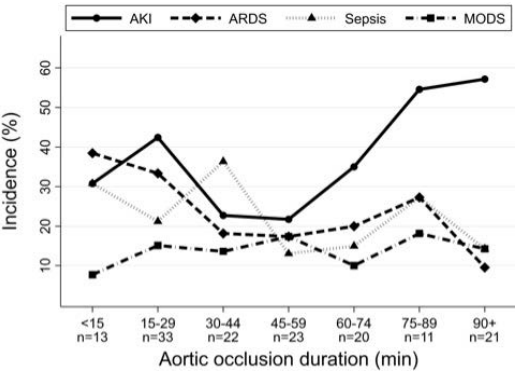
Introduction: Non-compressible torso hemorrhage is the most common cause of potentially preventable death in trauma patients. Resusciative thoraocotomy (RT) has been employed for the past half century as a method to obtain aortic occlusion (AO) in trauma patients and Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) use has become an increasing common method of AO. We hypothesized that increasing AO time (by any method) would be associated with increased ischemia reperfusion related complications and death.

Methods: The prospective multicenter AAST AORTA registry was utilized to identify patients undergoing AO from Nov 2013 until Feb 2018. To evaluate late complications of AO, patients receiving CPR during aortic occlusion or those who exsanguinated prior to 6 hours were excluded from analysis. Chi-squared test was performed to compare incidence of inflammatory complications in patients receiving RT or REBOA in Zone 1 (above celiac axis) or Zone 3 (below renal arteries). To examine time-associated morbidity, incidence of complications and mortality were analyzed by 15-minute intervals of AO (0 to >90 min) using Chi-squared test and multivariable Poisson regression.

Results: 992 patients from 18 AORTA centers were reviewed. 807 patients were excluded because they received CPR during AO (621) or exsanguinated within 6 hours of admission (186). The remaining 185 patients lived long enough to potentially develop ischemia reperfusion related complications. Univariate analysis demonstrated there were no significant differences in the rates of complications, (Table). 143 patients (77%) had duration of AO data available for analysis (0 to >90 minutes). When inflammatory complications were examined based on duration of AO, no association was observed based on univariate or multivariable analyses (FIGURE).

Conclusion: RT and REBOA are techniques to rapidly obtain temporary hemorrhage control for massive bleeding. After eliminating patients who received CPR or who died rapidly from exsanguination, there were no differences in mortality or complications based on technique, location, or duration of AO, suggesting that the initial physiological insult, and not duration of AO, is the predominate cause of inflammatory mediated morbidity and mortality.

No CPR or exsanguination	RT 49	Zone 1 75	Zone 3 61	N=185 p-value
AKI	33%	35%	33%	0.963
ALI/ARDS	22%	16%	21%	0.611
Sepsis	25%	24%	10%	0.068
MODS	14%	12%	12%	0.921
Mortality	33%	38%	22%	0.154



Poster # 26

EFFECTS OF DIASTOLIC BLOOD PRESSURE ON MORBIDITY AND MORTALITY IN BLUNT TRAUMA PATIENTS

Jeremy Dressler MD, Eric Benoit MD, Nishant Merchant MD, Jason Machan Ph.D., Stephanie Lueckel MD, Sean Monaghan MD, Tareq Kheirbek MD, Andrew Stephen MD, Daithi Heffernan MD, Michael D. Connolly MD, Charles A. Adams* Jr., MD,
Brown University Rhode Island Hospital

Introduction: Trauma resuscitation protocols focus on maintaining systolic blood pressure (SBP) to promote end-organ perfusion. However, whether a low diastolic blood pressure (DBP) affects outcome or simply reflects progression of physiologic changes from injury remains unclear. We hypothesize that diastolic blood pressure affects morbidity and mortality in blunt trauma patients irrespective of systolic blood pressure.

Methods: We reviewed the trauma registry at our Level 1 trauma center for all adult blunt trauma admissions to surgical critical care units between August 2015 to August 2016. Those with previously documented vascular disease and those who died within 24 hours were excluded from our sample. Hourly vital signs and lab values were extracted for seven days after presentation. The primary outcome was mortality, and secondary outcomes included rates of non-ST elevation myocardial infarction (NSTEMI) and acute kidney injury (AKI). We used the collected data points to construct a model describing the relationship among SBP, DBP, and outcomes based on Cox proportional hazard regression with time varying covariates.

Results: Our sample population consisted of 458 patients with 52802 data points. The median age was 63, 60% were male, and median ISS score was 14. Seven-day mortality was 21 (4.6%). Rates of AKI and NSTEMI were 13.8% and 4.6%, respectively. We identified no significant relationship between DBP and mortality. At 48 hours after presentation, among those with a systolic pressure 80 mmHg the hazard ratios for AKI and NSTEMI were 0.748 (95% CI:0.661-0.846) and 0.888 (95% CI: 0.761-1.037), reflecting the decreasing risk of these two events per every mmHg increase of diastolic pressure. Among those with a systolic pressure of 100 mmHg, the hazard ratios for AKI and NSTEMI were 0.879 (95% CI: 0.805-0.959) and 0.908 (95% CI: 0.833-0.989) for those with higher compared to lower diastolic blood pressures. From 72 to 168 hours after admission we observed significant associations between DBP and both AKI and NSTEMI regardless of SBP.

Conclusion: Higher DBP, even within normal SBP ranges, confers a decreased risk of AKI & NSTEMI in blunt trauma patients. Diastolic hypotension may play a larger role in the pathophysiology of end-organ injury than previously described. Treatment algorithms that target patients with low DBP may decrease complications in blunt trauma patients.

Poster # 27

HYBRID TRIAGE: PREDICTORS OF NEED FOR SIMULTANEOUS OPERATIVE AND ANGIOGRAPHIC INTERVENTION

Michael Mazzei MD, MS, Elizabeth Dauer MD, Joseph M. Lopez Jr., MD, Zoë Maher MD, Leonard L. Mason III, MD, Jessica Beard MD, Abhijit Pathak* MD, Thomas Santora* MD, Amy J. Goldberg* MD, Lars O. Sjoholm MD, Temple University Hospital

Introduction: A subset of trauma patients requires both operative and angiographic intervention for hemorrhage control. Conventionally, the surgeon must prioritize between these treatments, but use of the hybrid operative suite – with both catheter-based and open surgical capacities – can attenuate workflow logistics. However, most trauma patients do not need angiography, and inappropriate patient selection may increase resource strain or exclude appropriate patients from care. We hypothesize that there is a subset of trauma patients whose initial presentations are predictive of need for both operative and angiographic hemorrhage control, and that identifying these factors can inform the decision to use the hybrid OR.

Methods: All trauma patients from 2013-2016 in the Trauma Quality Improvement Program (TQIP) database who underwent operation for hemorrhage control with or without angiography were evaluated. Injury patterns and presentations were compared between those who underwent operative intervention alone, and those also requiring angiography.

Results: Of the 28,908 patients who underwent hemorrhage control surgery, 4,277 (14.7%) also required angiography. While these cohorts presented with varying degrees of hemorrhagic shock, vital signs were not predictive. Mechanisms associated with need for angiography included blunt injury (OR 1.32), especially involving motor vehicles (OR 1.63); injury patterns included pelvic injuries (OR 2.24), especially unstable pelvic ring fractures (OR 4.00) or those with concomitant external genitourinary or perineal injuries (OR 2.48), extremity vascular injuries (OR 2.62) and injuries in multiple compartments (OR 3.24). Negative predictors include gunshot wounds (OR 0.63), and isolated injuries to the thorax (OR = 0.41) Interventions were implemented in a mean of 1.89 hours for the operative group, but 5.65 hours in the angiography group, and need for angiography was associated with transfusion of 1.5 to 2 times more blood products in 24 hours. (All p-values significant to $p < 0.0001$).

Conclusion: Injury patterns can be identified in the trauma bay that correlate with a heightened need for angiography in addition to operative control of hemorrhage. This will allow the trauma surgeon to more accurately select patients who might benefit from hybrid room use, potentially decreasing time to hemostasis. This information will allow for optimal triage of the hybrid OR suite support while not overburdening a shared, multidisciplinary resource.

Poster # 28

CLINICAL IMPACT AND RESOURCE UTILIZATION OF A HYBRID OPERATING ENVIRONMENT AMONG SEVERLY INJURED PATIENTS: OVERSTATED OR UNDERUTILIZED?

David Carver MD, Julie Beveridge MD, Andrew W. Kirkpatrick MD, Scott D'Amours MDCM, Rohan Lall MD, Paul B. McBeth MD, Paul Cantle MD, Chad Ball* MD,
University of Calgary

Introduction: The potential utility and clinical benefit of hybrid operating theaters are increasingly postulated. Unfortunately, the economic cost and real-world efficiencies of these environments remain unclear. The primary aim of this study was to evaluate the utility, clinical impact and work flow of a new trauma hybrid operating theater.

Methods: All severely injured patients who were transferred to the hybrid suite for emergent care between April 4, 2013 and April 4, 2017 were compared to matched pre-hybrid patients from the 4 preceding years. Standard statistical methodology was employed ($p<0.05$=significant).

Results: 170 patients with severe injuries (mean ISS=23; hemodynamic instability=69%; hospital/ICU stay=21/10 days; mortality=14%) were transferred urgently (0-2hrs) to the hybrid suite. Most were young (38 years) males (84%) with blunt injuries (51%). Combined/hybrid trauma procedures occurred in 18% of cases (surgery (82%) and angiography (7%) alone). Procedures within the hybrid suite included: laparotomy (57%), thoracotomy/sternotomy (12%), extremity (14%), angioembolization of the spleen/pelvis/liver/other (9%), neck (9%), craniotomy (4%) and aortic endostenting (6%). The mean theater and procedure times were 178 and 124 minutes respectively. Compared to historical matched controls, the hybrid suite resulted in shorter door to intervention and total procedure times, and faster hemorrhage control in select patients ($p<0.05$). A clear benefit for survival was evident in specific cohorts.

Conclusion: Availability of a hybrid environment for severely injured patients reduces time to intervention, total procedural duration and salvages a select subset of patients who would not otherwise survive. The cost associated with a hybrid suite remains prohibitive for many centers.

Poster # 29

ANALYSIS OF OUTCOMES POST OPERATIVE MANAGEMENT OF TRUNCAL GSW AT LEVEL I VERSUS LEVEL II TRAUMA CENTERS

Daniel Wu DO, Shreya Jammula BS, Brian W. Gross BS, Chet A. Morrison MD, Alan D. Cook* MD, Susan P. Schulz MD, Jeanette Ward MS-CR, Frederick B. Rogers* MD,
Lancaster General Health/Penn Medicine

Introduction:While both Level I and II trauma centers have the resources necessary to manage gunshot wounds
(GSW), limited research exists comparing outcomes for this injury mechanism between designations. We hypothesized that there would be no differences in mortality or complications following surgical intervention for truncal GSW victims between Level I vs. II center types.

Methods: All adult (aged>18) firearm-related admissions to the Pennsylvania Trauma Outcome Study database from 2003-2015 were queried. Dead on arrival, transfer, and cases with a head Abbreviated Injury Scale (AIS) score ≥3 were excluded. The specific population of interest included all patients with truncal injuries (thorax AIS and/or abdomen AIS≥3). Multilevel mixed-effects logistic regression models assessed the adjusted impact of trauma center level (Level I) on overall mortality and complications.

Results: Of the 385,689 adult patients presenting to Pennsylvania Level I-II trauma centers from 2003-2015, 17,465 GSWs were identified, of which 4,761 met inclusion criteria (Level I: 3,949; Level II: 812). Overall unadjusted mortality rate (Level I: 16.8%; Level II: 14.2%; p=0.063) was not different between center types. Unadjusted complication rate was significantly higher at Level I centers (Level I: 35.6%; Level II: 29.4%; p=0.001). Adjusted analysis did not reveal any significant differences between center types in mortality (AOR 0.978, p=0.918) and complication (AOR 1.305, p=0.112) rates post-surgical intervention (Table 1). Within each institution, there was a difference in incidence of complications if surgical intervention was mandated, with Level I centers associated with a 2.9 increased odds of complications compared to 4.1 increased odds of complication at Level II centers.

Conclusion: Despite higher unadjusted complications at Level I centers, firearm-injured patients may experience better outcomes when managed at Level I rather than Level II trauma centers. Within center type, Level II institutions are associated with higher odds of complications in the event of operative management for truncal GSW, which may be attributed to low volume experience in treatment of these injuries.

Table 1. Adjusted odds ratios (AOR) for GSW outcomes post-operative management.

		Mortality		Complications
Variable	**AOR** (95% CI)	*p*	**AOR** (95% CI)	*p*
Level I	0.978 [0.635-1.504]	0.918	1.305 [0.940-1.814]	0.112
Age	1.025 [1.016-1.034]	<0.001	1.019 [1.012-1.026]	<0.001
ISS	1.058 [1.049-1.067]	<0.001	1.021 [1.014-1.028]	<0.001
		AUROC: 0.778		**AUROC: 0.633**

*Adjusted for male sex, shock index and injury year

Poster # 30

DO HOSPITAL CHARACTERISTICS INFLUENCE COMPLIANCE WITH 1:1:1 MASSIVE TRANFUSION PROTOCOL?

Matthew M. Fleming MD, Michael P. DeWane MD, Yawei Zhang MD,Ph.D., Kimberly A. Davis* MBA,MD, FACS, FCCM, Kevin Y. Pei MD, Yale School of Medicine

Introduction: Studies suggest that the ratio of red blood cells to plasma to platelets during massive transfusion impacts outcomes in trauma patients, though debate remains which ratio is superior (6:6:1 or 6:3:1). It is unknown if current national practice reflects these recommended standards. This study assesses overall compliance and the hospital characteristics associated with nonadherence to the recommended massive transfusion ratios.

Methods: The Trauma Quality Improvement Program database from 2013-2016 was queried for patients undergoing massive transfusion (defined as 50% of blood volume transfused within 4 hours of arrival or greater than 10 total units transfused within 24 hours of admission). Compliance was defined by transfusion ratios: 5.5-6.5:5.5-6.5:0.5-1.5 (blood:plasma:platelet packs) for 6:6:1 and 5.5-6.5:2.5-3.5:0.5-1.5 for 6:3:1. Univariate analysis was performed on patient and hospital characteristics and multivariable logistic regression was performed to identify characteristics associated with noncompliance in the use of the massive transfusion protocol (MTP). The role of thromboelastography in resuscitation could not be assessed as these data are not captured.

Results: There were 29,323 patients who underwent a massive transfusion protocol. Overall, 1,205 (4.1%) patients received the recommended transfusion ratio and 28,118 patients (95.9%) did not in the 6:6:1 group compared to 1098 (3.7%) receiving the recommended ratio and 28,225 (96.3%) receiving the non-recommended ratio in the 6:3:1 group. In the 6:6:1 group, transfusion volume >10 units (AOR 2.77, $p<0.001$), hospital transfer (AOR 1.25, $p = 0.018$), ED disposition to the ICU (AOR 1.18, $p = 0.044$), West region (AOR 1.30, $p = 0.04$), and hospitals with >15 ICU beds (16-25 beds AOR 1.41, $p = 0.004$, 26-35 beds AOR 1.44, $p = 0.004$, >35 beds AOR 1.19, $p = 0.13$) were associated with increased odds of adhering to the recommended MTP ratio. Interventions other than laparotomy (reference group, AOR 1.00), university teaching status (OR 0.76, $p = 0.003$), and hospital bedsize >200 (201-400 bed OR 0.50, $p < 0.001$, 401-600 beds OR 0.79, $p = 0.39$, >600 beds OR 0.67, $p = 0.18$) were associated with decreased odds of standard 6:6:1 MTP administration. In the 6:3:1 group, increasing transfusion volume >10 units (AOR 3.40, $p<0.001$), West region (AOR 1.30, $p = 0.03$), and increasing time in the ED (40-100 minutes AOR 1.24, $p = 0.007$, >100 minutes AOR 1.26, $p = 0.008$) were associated with increased odds of standard MTP. Interventions other than laparotomy (reference group, OR 1.00), length of stay >24 hours (AOR 0.52, $p<0.001$), South region (AOR 0.69, $p<0.001$), and >6 trauma surgeons at treatment hospital (AOR 0.84, $p = 0.02$) were significantly associated with decreased odds of standard MTP.

Conclusions: Few massively hemorrhaging trauma patients receive recommended ratios of transfusion products suggesting poor overall compliance. Notably, university teaching status and smaller numbers of ICU beds (markers of hospital resources) are associated with noncompliance with recommended transfusion ratios, although it is possible that thromboelastography may have been used and resulted in lower ratios but equivalent outcomes. Further studies are needed to improve compliance and evaluate mortality of those receiving compliant versus noncompliant transfusion protocols.

Poster # 31

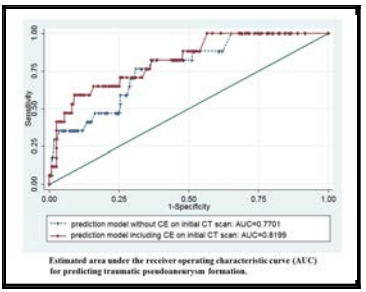
ASSOCIATION BETWEEN CONTRAST EXTRAVASATION ON CT SCAN AND PSEUDOANEURYSM IN PEDIATRIC BLUNT SPLENIC AND HEPATIC INJURY: A MULTI-INSTITUTIONAL OBSERVATIONAL STUDY

Morihiro Katsura MD,MPH, Shingo Fukuma MD,Ph.D., Akira Kuriyama MD,MPH, Tadaaki Takada MD, Yasuhiro Ueda MD, Yutaka Kondo MD,Ph.D., Takahiro Murakami MD, Hidemitsu Mototake MD, Shunichi Fukuhara MD, DMSc Department Of Surgery, Okinawa Prefectural Chubu Hospital

Introduction: Considerable practice variation remains in the management of pediatric patients with solid organ injury, and only limited data regarding traumatic pseudoaneurysm formation exist. The purpose of this study was to describe natural history and practice pattern for blunt splenic or/and hepatic injury in pediatric patients and to examine the association between an active contrast extravasation (CE) on initial computed tomography (CT) scan and the incidence of pseudoaneurysm.

Methods: We conducted a multi-institutional observational study using retrospectively enrolled children aged 16 years and under with blunt splenic or/and hepatic injury. Patients who showed CE on initial CT scan were compared with those that did not. A multivariate analysis using a logistic regression model was performed to determine the association between CE on initial CT scan and subsequent pseudoaneusysm formation. We generated the area under the receiver operating characteristic curve (AUC) to assess predictive performance of CE for pseudoaneurysm formation.

Results: A total of 236 patients (150 liver injury and 90 spleen injury) were enrolled from 10 institutions. Follow up CT scan were performed in 188 patients (80%). Pseudoaneurysm formations were observed in 17 patients (7.2%), and 4 patients (2%) were diagnosis by the delayed rupture of pseudoaneurysm. Abdominal angiography with/without embolization was performed in 33 patients (14%). The incidence of pseudoaneurysm was 29% in patients with CE and 5% in those without CE. A multivariate analysis showed that CE on initial CT was significantly associated with the higher incidence of traumatic pseudoaneurysm formation (Odds Ratio, 5.55; 95% Confidence Interval (CI), 1.54-20.1) after adjusting for AAST grade of injury, ISS and hemoperitoneum volume. AUC of the model including CE was 0.82 (95% CI, 0.72-0.92) and AUC of the model without CE was 0.77 (95% CI, 0.66-0.88).



Estimated area under the receiver operating characteristic curve (AUC) for predicting traumatic pseudoaneurysm formation.

Conclusion: In this study, follow up CT scans were frequently performed and angiographic intervention was considered the treatment modality of choice in a high proportion of cases in Japan. These findings suggested that the aggressive screening and treatment for pseudoaneurysm was carried out. Our results revealed that the sign of an active CE on initial CT scan was an independent predictor for traumatic pseudoaneurysm formation.

Poster # 32

THE ASSOCIATION OF SIMULATION-BASED TRAINING FOR PEDIATRIC TRAUMA RESUSCITAITON AND RISK-ADJUSTED MORTALITY AMONG ACS TQIP PEDIATRIC CENTERS

Aaron R. Jensen MD, MEd, Cory M. McLaughlin MD, Haris Subacius MA, Katie McAuliff Ph.D., Avery B. Nathens* MD,MPH,Ph.D., Carolyn Wong Ph.D., Daniella Meeker Ph.D., Henri R. Ford* MD, MHA, Randall S. Burd* MD,Ph.D., Jeffrey S. Upperman* MD, Children's Hospital Los Angeles

Introduction: The use of simulation-based team training for pediatric trauma resuscitation has recently increased, but an impact on patient outcomes has not been demonstrated. The purpose of this study was to determine the association between simulation use and patient outcomes.

Methods: ACS TQIP-Pediatric centers were surveyed to determine frequency of simulation use in 2014-15. Center-specific clinical data for 2016-17 were abstracted from the ACS TQIP registry (N=57,916 patients) and linked to survey responses. Comparisons were made across levels of simulation use: no simulation, low-volume simulation, high-volume simulation, and survey non-responders. Multivariable hierarchical logistic regression was used to evaluate the association of simulation use with mortality.

Results: Survey response rate was 75% (94/125 centers) with 78% of the responding centers (73/94) reporting simulation use. Risk-adjusted mortality was higher in centers not using simulation compared to centers using high-volume simulation (OR 1.73, 95% CI 1.09-2.73, p=0.02). Resuscitation process times (endotracheal intubation, head CT, craniotomy, and surgery for hemorrhage control) were not different between centers of differing levels of simulation use.

Conclusion: Risk-adjusted mortality is lower in TQIP-Pediatric centers using simulation-based training, but this decreased mortality may not be mediated by a reduction in time to critical procedures. Alternative mechanisms might relate to improved communication and teamwork, which together may improve resuscitation quality or decrease errors and lower the risk of adverse outcomes.

Poster # 33

ADULT TRAUMA CENTERS CARE FOR MORE PEDIATRIC PATIENTS THAN PEDIATRIC TRAUMA CENTERS: IS THERE A DIFFERENCE IN OUTCOMES?

Faisal Jehan MD, Muhammad Zeeshan MD, Narong Kulvatunyou* MD, Mohammad Hamidi MD, Lynn Gries MD, Andrew Tang* MD, El Rasheid Zakaria Terence O'Keeffe* MD, Bellal Joseph* MD, University of Arizona - Tucson

Introduction: Trauma-centers (TC) designation requires substantial financial and human resources. The aim of our study was to analyze the association of TC designation and mortality in pediatric patients.

Methods: We performed 6-years (2005-2012) analysis of all pediatric (age1-16) trauma patients in the NTDB. All severely injured (ISS>15) trauma patients were included. TC designation [Adult (A): A-I, A-II, A-III, A-IV & pediatric (P): P-I, P-II] was recorded. Our Outcome measure was mortality. We performed regression analysis to control for demographics, injury and vital parameters, and operative intervention.

Results: We included 47,279 patients from 400 trauma centers. Mean age was 9±5y. Median ISS was 17 [16-25]. Overall 45% were managed at pediatric-TC, with a mortality rate of 5.6%. There was no difference in mortality between adult and pediatric-TC. On regression analysis, the adjusted mortality was similar in patients managed at either center (OR: 1.01 [0.93-1.12]). On Sub-analysis, patients managed at P-II were more likely to die compared to P-I (OR:1.62[1.59-1.66]). Patients managed at P-II or A-II/III/IV centers were independently associated with a higher mortality compared to P-I, while there was no difference for A-I (**Figure 1)**

Conclusion: Severely injured pediatric trauma patients managed at the ACS-Level-I pediatric center have improved survival compared to those managed at level-II pediatric, and level-II, III or IV adult centers. Appropriate triage to either pediatric level I or adult level I trauma centers can improve survival in severely injured pediatric patients.

Figure 1:

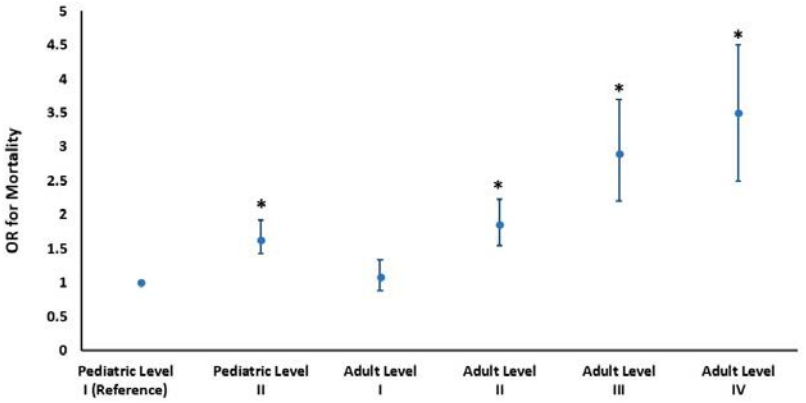


Fig. 1: All Trauma Centers

Poster # 34

NATIONAL TRENDS OF THORACIC ENDOVASCULAR AORTIC REPAIR (TEVAR) VERSUS OPEN REPAIR IN PEDIATRIC BLUNT THORACIC AORTIC INJURY

Areg Grigorian MD, Cristobal Barrios* Jr., MD, Sebastian Schubl MD, Jeffry Nahmias MD, Viktor Gabriel MD, Dean Spencer BS, Bima Hasjim BS, Carlos Donayre MD, University of California, Irvine - Orange County

Introduction: Blunt thoracic aortic injury (BTAI) occurs in <1% of all trauma admissions. Thoracic endovascular repair (TEVAR) has become the preferred treatment modality in most adult patients with BTAI but its use in pediatrics is not currently supported by device manufacturers. Little is known TEVAR application in pediatric patients. Considering the increased trend of using TEVAR in adult trauma patients, we hypothesized that this also extends to pediatric patients and confers a lower risk of mortality compared to open repair.

Methods: The National Trauma Data Bank (2007-2015) was queried for patients age$\leq$16 with BTAI. The primary end-points of interest included the incidence of TEVAR and open repair, as well as mortality in pediatric patients with BTAI undergoing intervention. Covariates (injury severity score $\geq$ 25 and hypotension on admission) were included in a multivariable analysis to determine risk for mortality in pediatric patients with BTAI undergoing open repair versus TEVAR.

Results: We identified 428 pediatric BTAI patients with 88 (20.6%) undergoing intervention. Of these, 65 underwent TEVAR (15.2%) and 23 (5.4%) underwent open repair. The rate of TEVAR increased from 2007 to 2015 (10.9% vs. 24.1%, $p<0.001$). Compared to open repair, TEVAR had a shorter mean length of stay (LOS) (16.2 vs. 24.0 days, $p<0.05$) and similar rate of mortality (3.5% vs. 2.3%, $p=0.49$). TEVAR was not associated with a lower risk for mortality compared to open repair ($p=0.61$). This remained true in a subset analysis of patients with Glasgow Coma Scale $\geq$ 8 ($p=0.96$).

Conclusion: The rate of TEVAR in pediatric BTAI more than doubled from 10.9% in 2007 to 24.1% in 2015. Compared to open repair, TEVAR was associated with a shorter mean LOS but was not associated with a lower risk for mortality. This remained true in patients without severe brain injury. Longitudinal studies to determine the long-term efficacy and complication rates, including re-intervention, development of endoleak, and/or need for further operations is needed as this technology is being rapidly adopted for pediatric trauma patients.

Poster # 35

COMPARISON OF GROUND LEVEL AND HIGHER LEVEL FALLS ON SUBSEQUENT MIDLINE SHIFT IN PEDIATRIC TRAUMATIC BRAIN INJURY

Areg Grigorian MD, Michael Lekawa* MD, Matthew Dolich* MD, Sebastian Schubl MD, Cristobal Barrios* Jr., MD, Victor Joe MD, Boris Borazjani MD, Jeffry Nahmias MD, University of California, Irvine - Orange County

Introduction: The mechanism of injury in trauma triage criteria is associated with pediatric traumatic brain injury (TBI). Up to 44% of cases occur after falls, with more activations occurring after falls from an elevated height compared to ground level (62.2% vs. 37.8%). We hypothesized that a fall from height is associated with higher risk for subsequent midline shift in pediatric TBI, compared to a fall from ground level.

Methods: The pediatric Trauma Quality Improvement Program (2016) was queried for patients age≤16 with TBI. Patients with known midline shift (> 5 mm) within 24 hours after time of injury were identified, as were patients that underwent imaging with no midline shift. The mechanism was identified by ICD-10 event codes. A logistic regression model was used for analysis.

Results: From 191 pediatric TBI patients with midline shift secondary to a fall, 44 (23.0%) were from ground level and 147 (77.0%) were from an elevated height. The most common mechanism in those with a fall from height was a fall from bed (24.5%). Compared to a ground level fall, patients with falls from height were younger (mean age, 3.3 vs. 5.5 years, $p<0.05$) with no difference in the highest Glasgow Coma Score within 24 hours ($p=0.56$). The risk of a midline shift was lower in those with a fall from a height (OR 0.64, CI 0.46-0.91, $p=0.01$), compared to ground level. In a subgroup analysis of patients age>4 years, there was no association between the level height of the fall and subsequent midline shift ($p=0.62$). However, the risk for midline shift in patients age<4 years after a fall from height was even lower (OR 0.40, CI 0.24-0.67, $p=0.001$).

Conclusion: In infants and toddlers with TBI, trauma activations due to falls from ground level (compared to from a height) are associated with nearly a three-fold higher risk of subsequent midline shift. In children four years and older that arrive as a trauma activation, there is no association between the level height of the fall and midline shift. Between birth and four years, children undergo significant cranial changes, rapid increase in brain size and suture ossification, possibly influencing their vulnerability to injuries after a fall. Trauma activations due to a minor mechanism of injury should not be discounted in predicting the severity of injuries, particularly in infants and toddlers with TBI.

Poster # 36

Pelvic angiography is effective for pediatric pelvic fracture; A Nation-wide propensity score matching cohort study in Japan

Yusuke Katayama MD,Ph.D., Tetsuhisa Kitamura MD, Dr.PH, Yuko Nakagawa MD,Ph.D., Takeshi Shimazu* MD,Ph.D., Osaka University Graduate School of Medicine

Background: The guidelines of Eastern Association for the Surgery for Trauma recommended that patients of pelvic fractures with hemodynamic instability and/or evidence of arterial intravenous contrast extravasation by CT should be considered for pelvic angiography. However, there was little evidence for children with pelvic fracture. We assessed the relationship between pelvic angiography for children with pelvic fracture and the prognosis using nation-wide hospital-based trauma registry in Japan.

Methods: Using Japanese Trauma Data Bank, we included pelvic fracture patients who were under 19 years old and registered from 2004 to 2015 in this study. Multivariable logistic regression analysis and conditional logistic regression analysis were used to assess the association between pelvic angiography and the prognosis of pediatric pelvic fracture patients after one-to-one propensity score matching for pelvic angiography versus non-pelvic angiography. The primary outcome was dead at hospital discharge.

Results: Among 1351 eligible patients with pelvic fractures, 221 patients (16.4%) received pelvic angiography and 1130 patients
(83.6%) did not receive pelvic angiography. In the univariate analysis, the proportion of dead at discharge was higher in the pelvic angiography group than the non-pelvic angiography group (13.6% [30/221] vs. 7.1% [80/1130]). However, in the multivariate analysis, the pelvic angiography group showed a more favorable survival outcome than the non-pelvic angiography group (adjusted OR 0.458, 95% CI; 0.251-0.836). In the propensity-matched cohort, the pelvic angiography group also showed a more favorable survival outcome than the non-pelvic angiography group (12.5% [27/216] vs. 19.9% [43/216], adjusted OR 0.469, 95% CI; 0.248-0.889, confidential OR 0.500, 95% CI; 0.274-0.911).

Conclusion: Pelvic angiography is also effective among children with pelvic fractures.

	All patients			Propensity-score matched patients		
	Pelvic angiography (+) (N=221)	Pelvic angiography (-) (N=1130)	SMD	Pelvic angiography (+) (N=216)	Pelvic angiography (-) (N=216)	SMD
Time of day, n (%)						
Daytime (9:00 am - 5:59 pm)	71(32.1)	458(40.5)	0.180	82(38.0)	71(32.9)	0.110
Nighttime (6:00pm - 8:59am)	134(60.6)	614(54.3)	0.130	125(57.9)	134(62.0)	0.090
Unknown	11(5.0)	58(5.1)	0.010	9(4.2)	11(5.1)	0.040
Weekend, n (%)	48(21.7)	334(29.6)	0.180	48(22.2)	48(22.2)	0.000
Age, median (IQR)	17(15-19)	16(13-18)	0.300	17(15-18)	17(15-18)	0.050
Male, n (%)	124(56.1)	684(60.5)	0.090	122(56.5)	124(57.4)	0.040
Shock on hospital arrival, n (%)	40(18.1)	74(6.5)	0.360	41(19.0)	40(18.5)	0.010
ISS, median (IQR)	30(21-41)	18(10-29)	0.800	29(21-41)	29(18-43)	0.040

	Total	Pelvic angiography (+)	Pelvic angiography (-)	Crude OR (95% CI)	Adjusted OR (95% CI)	Confidential OR (95% CI)
All patients*	(N=1351)	(N=221)	(N=1130)			
Dead at hospital discharge	110 (8.1%)	30 (13.6%)	80 (7.1%)	2.061 (0.876-2.141)	0.458 (0.251-0.836)	
Propensity score-matched patients*	(N=432)	(N=216)	(N=216)			
Dead at hospital discharge	70 (16.2%)	27 (12.5%)	43 (19.9%)	0.574 (0.466-1.327)	0.469 (0.248-0.889)	0.500 (0.274-0.911)

Poster # 37

THE TRAUMA "PIT STOP": A MORE EFFICIENT MEANS OF EVALUATING THE LESS SEVERELY INJURED PATIENT

Imad S. Dandan* MD, Gail T. Tominaga* MD, Kathryn B. Schaffer MPH, Fady S. Nasrallah MD, Melanie Gawlik RN, Dunya Bayat BA, Jiayan Wang BS, Tala H. Dandan BA, Walt L. Biffl* MD, Scripps Memorial Hospital La Jolla

Introduction: Avoidance of undertriage remains a primary goal of trauma systems and centers. To manage the resultant overtriage, innovative programs to effectively use hospital resources are essential. In our previously published study, we added Trauma Resource (TR) category to our tiered Trauma Activation (TA) algorithm, which allowed for prompt evaluation by the Emergency Department (ED) physician without activating the trauma surgeon (TS) and team. The TR protocol was subsequently modified by adding a Pit Stop (PS), wherein the patient would stop in the trauma resuscitation bay rather than go to an ED bed. We hypothesized that we could further improve efficiency without compromising patient care.

Methods: Patients in a level II trauma center not meeting criteria for TA but injured enough to be brought to a trauma center were assigned as TR for expedited ED evaluation. A PS was created in the ED resuscitation bay where TR patients were immediately assessed by a trauma nurse and/or an ED nurse, and board-certified ED physician. Diagnostic studies were ordered, and the TS consulted as needed. Demographic and outcome data were analyzed over a period of nine months and compared to the same data from pre-PS period. Comparisons were made using 95% confidence interval for variance and standard deviation calculations and unpaired t tests for two-tailed P values, with statistical difference, $p<0.05$.

Results: In the first 9 months after implementation, we treated 994 TAs and 474 TRs. The mean door to doc time were similar in the PS and pre PS periods (6.6 vs 7.1 min, $p=0.535$). Mean door to CT time were better in the PS than the pre PS period (39 vs 61.1 min, $p<0.0001$). Of the TR patients 346 (73%) were discharged from ED; 2 (0.4%) were upgraded to TA, and 126 (27%) were admitted. The admitted patients were similar to admitted TA patients (N=684) with regard to gender, mean Injury Severity Score, mean LOS and in-hospital mortality, but were older (61.4 vs 47.2 years, $p<0.0001$) and more often involved in a fall from same level injury (59.5% vs 20.1%, $p<0.0001$). TR patients had increased door to doc evaluation times (8.5 vs 0.4 minutes, $p<0.0001$) and increased door to CT times (34.5 vs 25.4 minutes, $p<0.0001$) as compared to admitted TA patients.

Conclusion: Instituting a PS resulted in a faster door to CT time and the same door to doc time. This approach has been safe and efficient. Although there is technically a 9.2% undertriage rate, the time to TS evaluation is minimized by the timeliness of CT scanning. This approach could be readily generalized and could save many resources on a large scale.

Poster # 38

VALUE OF DIAGNOSTIC IMAGING VARIES BY PATIENT AGE AND GENDER AND AFFECTS NEGATIVE APPENDECTOMY RATES

Joshua Tseng MD, Nicolas Melo* MD, Matthew Bloom* MD, Rex Chung* MD, Galinos Barmparas* MD, Eric J. Ley* MD, Daniel R. Margulies* MD, Rodrigo F. Alban* MD, Cedars-Sinai Medical Center

Introduction: Improved imaging modalities increase the accuracy of diagnosis for appendicitis. However, negative appendectomies (NA) still exist and are associated with unnecessary cost and morbidity. Past studies cite age and gender as predictors of NA, but the value of advanced imaging modalities remains unclear. We sought to analyze the effect of imaging on NA based on age and gender using a large national database.

Methods: The 2015 National Surgical Quality Improvement Project (ACS-NSQIP) database was queried for all patients who underwent appendectomy for suspected appendicitis. Data on patient demographics, imaging modality, imaging results, and pathology results were obtained. NA were defined as patients with no evidence of appendicitis on pathology. Patients were categorized by age and gender, with ≤45 defined as "younger" and >45 as "older". Rates of NA (NAR) for each imaging combination were calculated and compared with the Pearson's chi-squared test.

Results: Of the 11,841 patients in the study, 5.4% proceeded to surgery without imaging, while the rest had CT (78.7%), US (7.2%), MRI (0.3%), US+CT (7.5%), US+MRI (0.5%), CT+MRI (0.4%), or all three (0.1%). Of all age/gender groups, younger males were most likely to have no imaging (6.8%), while younger females were most likely to have an US (13.0%), US+MRI (1.5%), or US+CT (12.9%), $p<.001$. Overall NAR was 4.5%. CT's had the lowest overall NAR compared to US, MRI, or no imaging (2.5% vs 9.6% vs 11.1% vs 21.0%, $p<.001$). Younger males with no imaging had the lowest NAR (14.9%) compared to older males, younger females, and older females (18.4%, 26.7%, and 31.2%, $p<.001$). CT alone and US alone had similar NAR in older females (2.7% vs 2.5%, $p=1$), younger males (2.1% vs 2.0%, $p=.95$), and older males (2.2% vs 2.9%, $p=.54$). For younger females, CT alone had the lowest NAR (3.3%) compared to US only (15.4%), MRI only (11.5%), US+CT (9.8%), and US+MRI (9.4%), $p<.001$.

Conclusion: Imaging is frequently used in the diagnosis of appendicitis, and is associated with lower NAR. While patients of all age and gender groups benefit from imaging studies, CT alone and US alone are equivalent in older females, younger males and older males. In contrast, younger females have the lowest NAR with CT alone. Of patients who underwent surgery without imaging, younger males had the lowest NAR. These variations in NAR should be considered when obtaining imaging for appendicitis.

Poster # 39

EARLY VASOPRESSOR ADMINISTRATION IN PEDIATRIC BLUNT LIVER AND SPLEEN INJURY

David M. Notrica* MD, Bethany L. Sussman Ph.D., Lois W. Sayrs Ph.D., Shawn D. St. Peter MD, R. Todd Maxson* MD, Adam C. Alder MD, James W. Eubanks III, MD, Robert W. Letton* MD, Daniel J. Ostlie Todd Ponsky MD, Charles Leys MD, Karla A. Lawson MPH,Ph.D., Cynthia Greenwell RN, BSN, Amina Bhatia MD, Nilda M. Garcia* MD, Phoenix Childrens Hospital

Introduction: Traditionally, use of vasopressors for children with blunt liver and spleen injuries (BLSI) has been avoided. In a large multicenter prospective study of pediatric BLSI, some centers reported use of vasopressors in patients with BLSI. No prior studies have examined the outcomes associated with early vasopressor use in pediatric populations with BLSI. In this research, we compared outcomes for pediatric BLSI patients with and without vasopressor use in the first 48 hours of injury.

Methods: We completed a planned secondary analysis of vasopressor use from a multicenter, prospective study of 1006 children with confirmed BLSI. We matched vasopressor use within 48 hours to a propensity-scored control group of BLSI patients who were not given vasopressors within 48 hours of injury. Propensity scores were estimated from pre-treatment factors (demographics, hemodynamic instability upon admission, injury type, GCS, injury severity). Logistic regression was utilized to assess the risk of vasopressor use with mortality. Secondary outcomes were failure of BLSI non-operative management (NOM) due to bleeding, delayed bleeding, and PICU readmission. Fisher's exact tests were used to assess subgroup differences.

Results: 69 patients received vasopressors within the first 48 hours of injury, 62% had TBI and 54% were male. Median [interquartile range] age = 8.8 [3.9, 14.3] years; GCS = 5 [3, 15]; injury grade for spleen: 1 [0, 3]; and liver: 2 [1, 4]. The mortality rate for those who received vasopressors was 33% versus 11% for those who did not (AOR=4.1; $p<.05$). Failure of NOM for the patients who received vasopressors was 32% versus 7% (AOR=4.8; $p<.05$). For the subgroup of patients with TBI who received vasopressors, the mortality was 44% versus 20% [$p=.09$] for those who did not; and the failure of BLSI NOM was 28% versus 0% [$p<0.05$] for those who did not. For the non-TBI subgroup, the difference in mortality between the vasopressor group and the matched control did not reach statistical significance (15% vs 0.0%; $p=.20$), nor did the NOM failure (39% vs 17%; $p=.12$).

Conclusion: Vasopressor use in pediatric patients with BLSI is uncommon. Compared to a propensity matched control group, vasopressor use in pediatric BLSI is associated with a 4.1 increased risk of mortality and a 4.8 increased risk of NOM failure.

POSTER 40 WITHDRAWN

Poster # 41

DOWN AND OUT: A MULTICENTER ASSESSMENT OF ROUTINE SYNCOPE WORKUP AFTER TRAUMATIC FALL

Abid Khan MD, Purvi Patel MD, Jacqueline Brosius MD, Eliza Moskowitz MD, Kristen Ohe BS, Kevin Lee BS, Sean Liebsher BS, Michael Anstadt MD, Thomas Schroeppel* MD, Richard Gonzalez* MD, University Of Colorado Health-Memorial Hospital

Introduction: As the population of the United States ages, the incidence of traumatic falls is increasing. Falls are classified either as mechanical or as secondary to syncope. Controversy exists as to the utility of a syncope workup in patients who suffer a traumatic fall. Recent, single-institution studies suggest that routine syncope workup after a traumatic fall may not be necessary. An ECG, an echocardiogram (echo), and an evaluation of the carotid arteries by either ultrasound (US) or CT angiogram (CTA) are frequently reported to be the components of a complete "trauma syncope workup". The purpose of this project is to provide a multicenter assessment of the utility of a routine syncope workup after traumatic fall and of which factors may predict syncope as a cause of fall.

Methods: A multi-institutional, retrospective review of all patients presenting with a ground-level fall over a one year period was conducted at 2 ACS-verified centers. Patients were classified as having syncope leading to a fall or a mechanical fall based on review of the electronic medical record. Data collected included demographics, ISS, length of stay (LOS), and information relating to syncope workup testing.

Results: A total of 545 patients met the inclusion criteria. 189 patients had syncope or near syncope as a cause for fall and 356 sustained mechanical falls. Syncope positive patients were more likely to have an ECG (75.6% vs. 52.0%, $p<0.001$), an echo (54.0 % vs 20.2%, $p<0.001$), a CTA of the neck (15.9% vs 9.0, $p=0.016$), a carotid US (18.5% vs 2.5%, $p<0.001$), and to have received all 3 components of the complete trauma syncope workup (26.5% vs 5.9%, $p<0.001$). Syncope positive patients were more likely to have an arrhythmia on ECG (20.1% vs 11.0%, $p=0.004$), an ejection fraction (EF) <50% on echo (7.9% vs 2.3%, $p=0.002$), and carotid stenosis (5.8% vs 1.7%, $p=0.008$). On multivariable analysis, patients were more likely to be syncope positive if they had an EF<50% on echo (OR-3.363, CI-(1.322-8.555), $p=0.011$) or a previous history of syncope (OR-13.994, CI-(5.197-37.684), $p<0.001$), whereas patients were less likely to be syncope positive with increasing age (OR-0.985, CI-(0.975-0.996), $p=0.006$).

Conclusion: Due to the high incidence of arrhythmia, an ECG should be part of the routine workup of patients experiencing a fall after syncope. Echocardiogram has less utility in the standard assessment of these patients, however it should be considered on an individual basis. Carotid US or CTA is unnecessary in the routine workup of syncope and should be employed only if additional indications exist. Patients who have syncope as a cause for fall are more likely to have a low EF or a previous history of syncope than patients experiencing a mechanical fall. Compliance was poor in this multi-institutional review, as only a quarter of patients reporting syncope received a complete trauma syncope workup.

Poster # 42

WHOLE BODY COMPUTED TOMOGRAPHY VERSUS SELECTIVE IMAGING FOR BLUNT TRAUMA IN AN ACADEMIC TRAUMA CENTER

Jessica R. Burgess MD, Samir Abu-Hamad BS, MS, Michael Martyak MD, Jay Collins* MD, Eastern Virginia Medical Center

Introduction: Whole body computed tomography is frequently employed in trauma centers to diagnose injury after blunt trauma. Recently, studies have suggested that trauma surgeons and emergency medicine physicians can safely pursue selective imaging based on clinical judgment and physical exam findings. Many level I trauma centers in the United States are academic centers and resident physicians are an important part of the trauma team. The objective of this study was to determine if chief residents are able to accurately determine which computed tomography (CT) scans to obtain based on clinical judgment and physical exam.

Methods: This was a prospective IRB approved study undertaken at an academic Level I trauma center between. All patients between ages of 18-89 who were evaluated in the emergency department as lower level alerts with blunt trauma and evaluated by the trauma chief resident on arrival were included in the study. Patients who had already undergone imaging at a referring hospital were excluded. After performing a FAST exam and physical exam, the chief resident completed a questionnaire indicating whether they thought the patient would have a thoracic, abdominal or pelvic injury that would necessitate CT imaging. All patients received CT imaging of their head, cervical spine, chest, abdomen and pelvis after initial evaluation in the trauma bay. Imaging results were then compared to the questionnaires to determine resident accuracy in selective imaging for blunt trauma. Additional data regarding incidental findings, blood alcohol level, time of day, body mass index, Glasgow coma scale and presence of head or cervical injury was also obtained.

Results: We studied 232 patients, of whom 59.5% were male with an average age of 43.5 +/- 18.5 years. The total number of clinically significant thoracic, abdominal and pelvic injuries was 41, 17 and 10, respectively. If chief residents had proceeded with selective imaging and not obtained a CT scan, 58.5% of chest injuries, 88.2% of abdominal injuries and 80% of pelvic injuries would have been missed. Overall sensitivity and specificity was 30.9% and 94.9%, respectively. Injuries most often missed in the chest were rib, clavicle and scapula fractures. Lumbar fractures and pelvic fractures were the most commonly missed in the abdomen and pelvis. With selective scanning, 78 incidental findings (mostly pulmonary and adrenal nodules) would have been missed.

Conclusion: Our data suggests that, at our level I trauma center, the practice of selective scanning would have missed 69.1% of injuries. These injuries ranged in severity from simple rib fractures to splenic lacerations and vertebral fractures. While chief residents had excellent specifity, sensitivity was 30.9%. The poor ability to selectively image may be in part due to a false sense of security, as the resident knew that the patient would have a total body CT regardless of their predictions. There are frequently times when the chief resident is not able to be present for the initial evaluation of lower level alerts if they are involved in other patient care or are in the operating room. This further supports the use of whole body CT scans. While some studies have shown that attending emergency medicine and trauma surgeons can safely selectively scan blunt trauma patients, selective scanning in an academic institution with residents may result in a significant number of missed injuries and is not recommended at this time.

Poster # 43

RUN DON'T WALK: IMPLEMENTATION OF A STAT INTERVENTIONAL RADIOLOGY RESPONSE TO BLEEDING PATIENTS

Michelle K. McNutt* MD, Anil K. Pillai MD, Angie L. Garrett RN, Bryan A. Cotton* MD, John A. Harvin* MD, Laura J. Moore* MD,
Charles E. Wade* Ph.D., Mouayyad Zaza Lillian S. Kao* MD, University of Texas Health Science Center-Houston

Background: The American College of Surgeons Committee on Trauma (ACS-COT) now requires an experienced radiologist to be available within 30 minutes to perform interventional procedures for level 1 and 2 trauma centers. To address this, we created a new interventional radiology (IR) STAT trauma activation pathway and prospectively followed the impact on early blood product utilization and mortality.

Methods: Development and implementation of an IR STAT trauma activation pathway was performed after identifying three activation criteria through retrospective review of our trauma registry: intravenous (IV) contrast extravasation with transfusion requirement, zone 3 resuscitative endovascular balloon occlusion of the aorta (REBOA) placement, and need for IR recognized in the operating room (OR). All activations from March 2017 through January 2018 were prospectively identified and maintained in a database. Outcomes were compared to a matched historical control group one year prior to IR STAT trauma with same three clinical indications. Mann-Whitney U-test and chi-square analyses were performed ($p<0.05$).

Resuts: Of the 5,715 adult trauma patients, 1,329 were level 1 trauma activations, and 30 IR STAT trauma activations occurred. Reasons for IR STAT included IV extravasation with transfusion requirement [n=17, 57%], trauma attending discretion [n=6, 20%], zone 3 REBOA placement [n=4, 13%], and need for IR from OR [n=3, 10%]. Our survival rate was 86% despite a median ISS of 36 and 50%predicted survival based on median trauma injury severity score (TRISS). No deaths were secondary to hemorrhage and 68% of survivors were discharged home. Compared to the historical control group, the IR STAT group had a significantly shorter time to start of IR procedure (75 min vs 196 min, $p<0.001$). Although the IR STAT group had a statistically lower predicted survival by TRISS, there was no difference in actual survival rate (Table). While the overall compliance with IR response time of 30 minutes was 53%, compliance improved over time after PI opportunities were identified and the pathway adjusted. Patients that did not meet the 30 minute IR response time had a median response time of 60 minutes.

	IR STAT (n=30)	Control (n=23)	p-value
Median age, years (IQR)	39 (27, 65)	44 (28, 55)	0.801
Median Injury Severity Score (IQR)	36 (29, 42)	38 (30, 43)	0.653
Median time to IR procedure start, min (IQR)	75 (62, 92)	196 (147, 210)	<0.001
Therapeutic embolization rate, %	73%	67%	0.635
Median RBC+FFP transfusion, 0-4 hr (IQR)	8 (4, 11)	10 (4, 18)	0.574
Median RBC+FFP transfusion, 0-24 hr (IQR)	8 (6, 13)	12 (4, 26)	0.280
Predicted survival rate by TRISS, %	50%	81%	0.020
Actual survival rate, %	86%	78%	0.447
Discharge home, %	68%	39%	0.035

Conclusion: Implementation of an IR STAT trauma pathway to treat critically injured, bleeding patients at a high-volume level 1 trauma hospital is feasible and results in excellent outcomes. This protocol was associated with a dramatic reduction in time to IR intervention, and did so with a high therapeutic embolization rate (limited over-triage) and zero bleeding-related deaths. Early IR remains an important adjunct to hemorrhage control in the trauma patient.

Poster # 44

Single Pass Whole-Body versus Organ-Selective Computed Tomography for Trauma: Is it a matter of time to diagnosis versus radiation exposure?

Ana M. Del Valle MD, Hernan E. Munevar MD, Carlos A. Ordoñez* MD, FACS, Carlos A. Garcia MD, Michael Parra* MD, FACS, Ferrada Paula* MD, Constanza Navarro MD, Ricardo Ferrada MD, FACS, Juan P. Herrera MD, Alfonso Holguin MD, Alejandra De Las Salas Laura C. Ibarra Juan C. Puyana* MD, FACS, Alberto F. Garcia MD, MSC Fundacion Valle del Lili

Introduction: Single Pass Whole-body computed tomography (WBCT) has been used as a high yield diagnostic tool in trauma. However, increased exposure to radiation and delay in treatment, have been cited as challenges to its widespread use. We hypothesized that WBCT has at least the same radiation exposure compared to organ-selective CT scan (OSCT) and it does not necessarily inflict further delays in treatment.

Methods: We performed a retrospective review of all trauma patients in whom CT-scans were performed on arrival at a Level I Trauma Center from January, 2016 to December, 2017. Patients were divided into two groups: patients with OSCT and patients in whom WBCT's were performed. Patient demographics, clinical, imaging (CT-scan), and injury-related characteristics were compared between the two groups.

Results: A total of 123 patients were included: 53 in the OSCT group and 70 in the WBCT group. In the OSCT group the median age was 28 (IQR 22-39), ISS 10 (IQR 9-17), RTS 7.9 (IQR 5.9-7.8), 64.1% of the patients had penetrating trauma and chest injuries were the most common injured body cavity (79.3%). In the WBCT group the median age was 29 (IQR 23-50), ISS 16 (IQR 11-25), RTS 6,9 (IQR 5.9-7.8), the most common trauma mechanism was blunt (65.7%) and head injuries were the most common (71.9%) injured organ. The OSCT group had longer ER-to-CT scan time than the WBCT group (41 vs 28 minutes, p=0.01) (Table 1). The OSCT group required subsequent trips to the scanner suite for follow-up studies to rule out other potential injuries which in turn did not occur in the WBCT group (47.2% vs 0%, p< 0.001). CT Brain was the most frequent follow-up study required in the OSCT group. The total radiation exposure dose was higher in the OSCT group compared to the WBCT group [22 mSv (IQR 6-31) vs 15.1 mSv (IQR 9.9-24.8) p<0.001].

Table 1.

	WBCT N=70 n (%)	OSCT N=53 n (%)	P value
ISS*	16 (11 – 25)	10 (9-17)	p < 0.001
RTS*	6.9 (5.9-7.8)	7.9 (5.9-7.8)	0.01
Trauma Mechanism			
Penetrating	10 (14.3%)	34 (64.1%)	p < 0.001
Blunt	60 (85.7%)	19 (35.9%)	
Multiple Trauma	57 (81.4%)	31 (58.5)	p < 0.001
ER-to-CT Scan time (minutes)*	28 (13-50)	41 (21-60)	0.01
Extra CT-Scan	0 (0)	25 (47.2%)	p < 0.001
Total radiation (mGy)*	1004 (658-1652)	2040 (1475-3098)	p < 0.001
Total radiation (mSv)*	15.1 (9.9-24.8)	22 (6-31)	p < 0.001

WBCT: Whole Body CT scan, ISS: Injury severity score, RTS: Revised Trauma Score, *Median (Interquartile range)

Conclusion: Trauma patients undergoing WBCT's had lower total radiation exposure with no delay in treatment secondary to the information obtained from their initial scan. OSCT has the potential of missing potentially life threatening injuries that require subsequent follow-up scans, which in turn increases the patients overall radiation exposure and potentially delaying definitive surgical treatment.

Poster # 45

A NOVEL QUANTITATIVE METHOD TO PREDICT THE LIKELIHOOD OF HOLLOW VISCUS INJURY IN ABDOMINAL TRAUMA WITH FREE FLUID ON COMPUTED TOMOGRAPHY

Karen E. Burtt MD, Aaron Strumwasser MD, MSc, FACS, Kenji Inaba* MD, Kazuhide Matsushima MD, Damon Clark MD, Elizabeth Benjamin MD,Ph.D., Lydia Lam MD, Demetrios Demetriades* MD,Ph.D., LAC+USC Medical Center

Introduction: The presence of free fluid on Computed Tomography (CT) in a stable patient with abdominal trauma presents a diagnostic and therapeutic challenge. A surgeon must balance the likelihood of non-therapeutic laparotomy with the morbidity of delayed diagnosis and treatment of a hollow viscus injury (HVI). Hounsfield units (HUs) in conjunction with other CT features suggestive of HVI (bowel wall thickening, mesenteric vascular edema, fat stranding, free air, beading, extraluminal contrast extravasation) may provide additional diagnostic and therapeutic value and lead to more rapid diagnosis and treatment. We sought to validate the utility of HU of intraabdominal fluid at predicting HVI, and to create a model integrating HUs to predict the presence of HVI in stable patients with abdominal trauma.

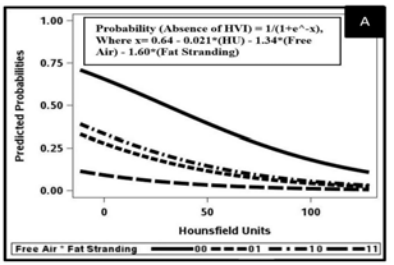
Methods: We retrospectively reviewed the abdomino-pelvic CTs of 297 consecutive patients (2011-2015) with free fluid findings (n = 152) that underwent exploratory laparotomy for suspected HVI. Patients with concomitant solid organ injury and abdominal vascular injury on CT were excluded from analysis. Variables abstracted from the registry included patient demographics, presenting vitals, and findings suggestive of HVI on CT (Hounsfield Units, bowel wall thickening, free air, fat stranding, mesenteric vascular edema, contrast extravasation). Stepwise logistic regression analysis was used to identify statistically significant predictors on CT scan for HVI.

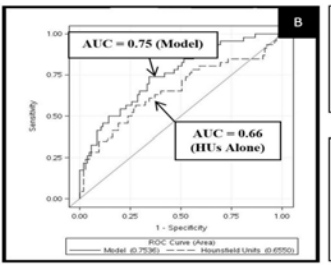
Results: Of 152 patients (mean age ± SD = 33 ± 15 years, mean ISS ± SD = 12 ± 9, 55% blunt injury) with intraabdominal fluid on CT, 106 (70%) had HVI. Vitals were normal on presentation (HR ± SD = 93 ± 20, BP ± SD = 127 ± 22/82 ± 18). A novel predictive index **(Figure A)** was developed to rule out HVI in patients with intraabdominal free fluid on CT, defined by the equation:

PROBABILITY(ABSENCE of HVI) = 1/(1+e^-x),

where x= 0.64 - 0.021*(HU) - 1.34*(FREE AIR) - 1.60*(FAT STRANDING).

A receiver operating curve (ROC) analysis of the model achieved an AUC of 0.75 (CI 0.67-0.84, p<0.01), with 0.66 (CI 0.55-0.75, p<0.01) attributable to HU **(Figure B)**. A HU of 30 was identified as the optimal threshold to maximize both sensitivity and specificity of the model (Youden's J index). Patients with HU<30 were substantially and significantly less likely to have HVI than their HU>30 counterparts (OR 2.9, CI 1.4-5.9, p<0.01).





A) Probability of absence of HVI in patients with abdominal free fluid at varying HU.

B) ROC curve for predictive model and HU alone in patients with abdominal free fluid.

Conclusion: In trauma patients with intraabdominal free fluid on CT, a novel predictive index may limit the number of unnecessary operations in patients with CT evidence of free fluid and miss fewer HVIs.

Poster # 46

DOES FAST EXAM DECREASE NON-THERAPEUTIC LAPAROTOMIES IN ABDOMINAL GUNSHOT WOUNDS?

Nina S. Cohen MD, Rhiannon J. Bradshaw BS, Jay N. Collins* MD, Eastern Virginia Medical Center

Introduction: Most abdominal gunshot wounds (GSW) that violate the peritoneal cavity will cause injuries requiring therapeutic laparotomy. However, some abdominal, flank, chest and back GSW do not violate the peritoneal cavity and will not require laparotomy. Non-therapeutic laparotomy carries increased length of stay and many associated morbidities. We hypothesized in hemodynamically normal patients with torso GSW, FAST exam would be beneficial in minimizing non-therapeutic laparotomy rates.

Methods: Over the time period January 1, 2016 to Feb 28, 2018, a retrospective review was conducted of patients with torso GSW and systolic blood pressure (SBP) greater than 90 mmHg. Demographics such as age, gender, initial systolic blood pressure, base deficit and FAST results were identified. FAST results were correlated with computed tomography (CT) or operative findings. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of FAST in abdominal GSW were determined.

Results: Over 26 months we evaluated 683 patients at our level 1 Trauma Center with GSWs. Torso GSW with SBP greater than 90 mmHg was seen in 231 patients. The mean age was 29.1 years and 89% male. Fifty-one patients did not undergo FAST exam or went directly to the operating room with high suspicion of abdominal injury and were excluded. Of the remaining 180 patients, 31 had a positive FAST associated with abdominal injuries for a PPV of 89%. Thirty-two patients had a negative FAST but abdominal injuries found on CT or exploratory laparotomy for a NPV of 78% and specificity of 97%. The sensitivity of FAST for torso GSW was 49%. A total of nine non-therapeutic laparotomies were performed, four of whom had a negative FAST exam.

Conclusion: Not all patients with a torso GSW will require laparotomy. If the SBP is greater than 90mmHg, it is safe to perform FAST. If the FAST is positive, it is prudent to go directly to the OR as there is a 97% chance of finding an injury that needs definitive care. If the FAST is negative, obtaining CT scan to identify possible injuries may avoid non-therapeutic laparotomy in a significant number of hemodynamically normal patients.

Poster # 47

A SHOT IN THE DARK: USEFULNESS OF ULTRASOUND-GUIDED DIAGNOSTIC PERITONEAL ASPIRATION IN THE ASSESSMENT OF NON TRAUMA ACUTE SURGICAL PATIENTS

Mauro Zago* MD, FEBS EmSurg, Claudio Gianotti MD, Alessia Malagnino MD, Maria Masutti MD, Giulia Carrara MD, Samantha Bozzo MD, Policlinico San Pietro

Introduction: Abdominal free fluid or localized collections are a common findings in many acute abdominal conditions. They are usually diagnosed by ultrasonography (US) or CT scans. Fluid characteristics can orient definitive diagnosis. The aim of this study is to evaluate the impact of systematic use of US-guided diagnostic peritoneal aspiration (US-DPA) in the decisional process of acute abdominal diseases.

Methods: US-DPA was prospectively and systematically performed in all patients (pts) with spontaneous or postoperative acute abdominal conditions associated with free fluid or localized collections found on US or CT, whenever final diagnosis or therapeutic strategy remained undefined after imaging. Trauma cases were excluded. Fluid analysis was performed only when the aspect of the retrieved fluid was not decisive for decision making. US-DPA feasibility, safety and the number of clinical decisions influenced by DPA were analyzed. The procedure was performed bedside, without local anesthesia, with a 19/21 G needle, preferably with an in-plane technique. Statistical analysis was made comparing observed vs. expected cases in which DPA had a positive impact on patient management, and positive vs. negative DPA impact. The "N-1" Chi-squared test was used. Significance level was set at alpha = 0.05.

Results: Fifty-nine pts (35 M, 24 F; mean age 61 y/o – range 18-92) underwent 64 US-guided DPA (Table 1). Fifty-two had free peritoneal fluid, 7 localized collections. In 5 (8.5%), DPA was performed twice at the same time in a different abdominal site, to check the aspect of the first sample. In 1/64 (1.5%) no fluid was retrieved (DPA feasibility = 98.5%). No complications were observed. Five samples were sent for chemical analysis. Management was enhanced by US-DPA as depicted in Table 2. In 1/59 patient (1.7%) DPA results interpretation (2 samples, serous-hematic fluid) was wrong, causing a one day delay of re-operation (anastomotic leak). In 17/59 (28.8%) US-DPA authorized a successful conservative management, without resorting to any other exam. In total, 39 pts (66.1%, $p<0.001$) had treatments (conservative, procedural, surgical) favorably driven by US-DPA results, with a clear change on clinical decisions in 23 (39%, p=NS). Positive impact of US-DPA resulted statistically significant vs. negative impact ($p<0.001$). In 16/59 pts (30.5%) US-DPA was performed after CT.

Conclusion: Uncertainty about the qualitative characteristics of free fluid or collections is not uncommon managing acute surgical pts. Our study shows that US-DPA is a safe procedure. The risk of mismanagement due to US-DPA results was very low (1,7%). US-DPA is a simple and safe bedside procedure. It enhances the clinical decision: further imaging, surgical/procedural treatment, safer patient observation. US-DPA can be diriment in the assessment of acute surgical patients.

Clinical problem/suspicion	#	%
Abdominal colic	2	3.4%
Ascitis of unknown etiology	1	1.7%
Epigastric pain	1	1.7%
Appendicitis	2	3.4%
Terminal ileitis	3	5.1%
Cholecystitis	2	3.4%
Diverticulitis	4	6.8%
Postop. complications	39	66%
Postop. bleeding	1	1.7%
Gynecological disorders	2	3.4%
Intestinal ischemia	2	3.4%
Total	59	

Table 1 – Indications for US-DPA

Clinical decision	#	%
Conservative treatment*	25	42.4%
Microbial cultural exam	9	15.2%
Other diagnosis (gynecological disorder)	2	3.4%
Drainage	8	13.5%
Emergency surgery (without further CT)	4	6.8%
Emergency surgery (with further CT)	1	1.7%
Delayed surgery (without further CT)	1	1.7%
Discharge	2	3.4%
Further CT	2	3.4%
Not relevant	5	8.5%
Total	59	

Table 2 – Decision making after US-DPA

** 17/25 driven by DPA w/o further imaging*

Poster # 48

BOWEL ISCHEMIA SCORE (BIS) CORRELATES WITH THE NEED FOR OPERATION IN PATIENTS WITH ADHESIVE SMALL BOWEL OBSTRUCTION

Kelly A. Boyle MD, Rachel S. Morris MD, Travis P. Webb* MD, MHPE, David J. Milia MD, Savo Bou Zein Eddine MD, Christopher M. Dodgion MBA,MD, MSPH, Christopher S. Davis MD,MPH, Lewis B. Somberg MD, Marc A. De Moya* MD, Colleen M. Trevino Ph.D., MSN, FNP, Medical College of Wisconsin

Introduction: Nonoperative management of adhesive small bowel obstruction (SBO) is successful in up to 80% of patients. Current recommendations advocate for computed tomography (CT) scan in all patients with SBO to supplement surgical decision making. It is unknown how CT findings influence need for surgery in patients without immediate clinical operative indications. We hypothesized that a Bowel Ischemia Score (BIS) predicts the need for operative intervention in the setting of SBO.

Methods: This was a retrospective analysis of a retrospectively and prospectively collected adhesive SBO database over a 6-year period. A BIS was developed based on the Eastern Association for the Surgery of Trauma (EAST) guidelines for CT findings suggestive of bowel ischemia. One point was assigned for each of the six variables (see table). Early operation was defined as within 6 hours of CT scan.

Results: Of the 296 patients in the database, 262 (88.5%) underwent axial imaging. The operative rate was 30.9%with a median time from CT to operation of 21 hours (IQR 5.2-59.2 hours).

EAST guidelines for CT findings of bowel ischemia:		1. Reduced bowel wall enhancement 2. Bowel wall thickening 3. Mesenteric venous congestion		4. Mesenteric fluid 5. Unusual course of mesenteric vasculature 6. Ascites		
Bowel ischemia score	**Surgery within 6 hours of CT**	**Surgery >6 hours after CT**	**No surgery**	**Total**	**OR (95% CI)**	**P-value**
0	2 (1.8%)	20 (17.5%)	92 (80.7%)	114 (38.5%)		
1	9 (8.7%)	24 (23.3%)	70 (68.0%)	103 (34.8%)	6.76 (1.42, 32.17)	0.016
2	7 (20.6%)	11 (32.4%)	16 (47.0%)	34 (11.5%)	18.52 (3.64, 94.32)	<0.001
3	4 (36.4%)	4 (36.4%)	3 (27.3%)	11 (3.7%)	36.04 (5.51, 235.90)	<0.001
Total	22	59	181	262		**<0.001**

BIS ≥ 1 was present in 148 (56.5%) patients. Most (162 / 217, 74.6%) with a BIS of 0 or 1 were successfully managed nonoperatively, whereas the majority of those with a BIS of 3 required operative intervention (8 / 11, 72.7%). The odds ratio for early operative intervention was 18.5 and 36 for those with a BIS of 2 and 3, respectively. With a BIS of 0, 1, 2, and 3, small bowel resection was performed in 3.5%, 8.7%, 17.6%, and 36.4%of patients, respectively.

Conclusion: The cumulative signs of bowel ischemia on CT scan, rather than the presence or absence of any one finding, correlate with the need for operative intervention. Further work will be done to validate this scoring system and analyze the weight of each variable, as well as establish comprehensive clinical factors that predict operation.

Poster # 49

BLUNT CEREBROVASCULAR INJURY: HAVE WE GOTTEN CARRIED AWAY WITH SCREENING CTA?

Laura A. Kreiner MD, John J. Como* MD,MPH, Benjamin L. Reed BS, Vanessa P. Ho MD,MPH, Joseph F. Golob MD, Jeffrey A. Claridge* MD, MS MetroHealth Medical Center

Introduction: Over the past several decades, blunt cerebrovascular injury (BCVI) screening criteria have expanded in the hope of minimizing the incidence of stroke. Recommended indications for computed tomographic angiography (CTA) of the neck include cervical spine fractures, complex facial and skull base fractures, traumatic brain injury, and major thoracic injuries. We hypothesized that there would be specific characteristics of patients with cervical spine fractures such as age, mechanism of injury, and fracture patterns, in whom CTA of the neck could be safely deferred.

Methods: Blunt trauma patients ≥ 15 years old admitted from January 2009-June 2015 who sustained occipital condyle and/or cervical spine fractures were included. Patient demographics, mechanism of injury, cervical spine fracture patterns, and associated injuries as they related to the rate of BCVI were recorded. Fracture patterns were classified between upper (C1-3) and lower (C4-7) cervical spine, as well as at each individual cervical spine level. Fractures were characterized as lateral mass, vertebral body, lamina, pedicle, transverse process, or spinous process. A matched case-control analysis was performed based on age and mechanism of injury. Low energy mechanism of injury was defined as either a same level fall or assault. High energy mechanisms included motor vehicle collision, motorcycle/ATV collision, fall from height, and auto-pedestrian collision. Elderly patients were defined as those 65 years and older.

Results: A total of 1275 patients with occipital condyle or cervical spine fractures were identified. Nine hundred and eight (71.2%) underwent BCVI screening, which established the analyzed population. Mean age was 57.5±23.2 years, and 55.4% were male. BCVIs were identified in 9.3% (n=84). BCVI was identified at all cervical levels. When evaluating fracture types, lateral mass fractures were significantly associated with BCVI in the upper (35.7%) and lower (41.7%) cervical spine. Within the total screened population, low energy mechanism, when compared with higher energy mechanism, was the only factor associated with lower rates of BCVI (5.9% vs 10.7%, p=0.024). No additional injuries were associated with a lower rate of BCVI. Evaluation of fracture pattern was performed via case-control by matching age and mechanism of injury. Elderly patients were found to have a 5.7% BCVI rate. No fracture patterns were associated with a lower rate of BCVI. Elderly patients with high energy mechanisms had a BCVI rate of 10.7%, and no fracture patterns were associated with not having a BCVI. Similarly, young patients with low energy mechanism had a BCVI rate of 6.9%, compared with a 10.9% rate in those with high energy mechanism. Fracture patterns were not identified to be associated with a lower rate of BCVI.

Conclusion: Within a screened population of patients with cervical spine fractures, age, mechanism of injury, and fracture pattern were not associated with a lower rate of BCVI. Thus, in this high-risk population, no patient should be excluded from BCVI screening based on age, mechanism of injury, or specific fracture pattern. However, special attention is warranted for lateral mass fractures as they have a significantly higher rate of BCVI.

Poster # 50

THE USE OF A NEW GENERATION MULTICHANNEL TEG® 6S ANALYZER IN A MODERN SURGICAL INTENSIVE CARE UNIT: MORE IS LESS!

Galinos Barmparas MD, Christos Colovos MD,Ph.D., Navpreet K. Dhillon MD, Kavita A. Patel George P. Liao MD, Russell Mason PharmD, Daniel R. Margulies* MD, Eric J. Ley* MD, Cedars-Sinai Medical Center

Introduction: The use of thromboelastography (TEG) in critically ill, surgical and trauma patients has expanded over the last decade. Several technical variations, however, including the addition of anticoagulants and/or activators to the blood sample, may complicate its use. In addition, the TEG instrument requires daily calibration and is recommended to be used only by trained personnel. We recently initiated the use of a new generation, multichannel TEG analyzer (6S) in our surgical intensive care unit (SICU) that utilizes an innovative all-in-one cartridge and simplifies the process of obtaining a full coagulation profile. It remains unclear, however, whether the combination of all assays could provide a better understanding of the patient's coagulation profile. The purpose of this study was to evaluate the importance of the additional information derived from these comprehensive coagulation analyses and explore the variation in stratifying patients as coagulopathic based on the results from each assay.

Methods: Over a 6-month study period ending in 02/2018, data from all patients admitted to the SICU who had a TEG analysis performed were prospectively collected. A citrated multichannel cartridge developed for the TEG® 6S analyzer was utilized and the following assays were performed simultaneously: (1) Kaolin (CK), (2) rapid TEG (CRT), (3) Kaolin with heparinase (CKH) and (4) functional fibrinogen (CFF). TEG values from all assays were stratified as indicative of coagulopathy based on elevated R-time, elevated K-time, decreased MA, decreased angle, prolonged TEG-ACT and decreased FLEV based on accepted ranges. Samples were accordingly classified as potentially requiring transfusion of fresh frozen plasma (FFP), platelets (PLTs), or cryoprecipitate (Cryo).

Results: Overall, 417 TEG samples from 207 patients were analyzed. Almost half of the samples (49.2%) were classified as indicative of coagulopathy based on at least one component of the four assays. Overall, 24.6% of patients had a potential indication for FFP transfusion per either a prolonged R-time from the CK assay (14.6%) and/or a prolonged TEG-ACT from the CRT assay (11.9%). The proportion of samples with both studies indicating FFP transfusion, however, was only 2.9%. Over a third of the patients (33.8%) had a potential indication for PLT transfusion based on a decreased MA: 31.6% with CRT and 23.5% with CFF. However, a decreased MA was consistently noted in both assays 22.3% of the time. Lastly, 40.5% had a potential indication for Cryo based on prolonged K-time, decreased angle and FLEV. More specifically, decreased K-time was observed in 28.3% based on CK; decreased angle was noted in 20.7% with CK and 12.4% with CRT; decreased FLEV was noted in 26.2%. However, only 6.0% of relevant studies were all simultaneously indicative for the need for Cryo transfusion.

Conclusion: In addition to being easier to use and less labor intensive, the new generation multichannel TEG® 6S analyzer provides a complete coagulation assessment of the critically ill surgical patient. The additional information obtained simultaneously from the four different assays may impact clinical decision making as they allow for increased specificity and correlations between assays. Further studies will focus on whether this may lead to improved and more targeted correction of coagulopathy, potentially saving blood products, factors, and cost.

Poster # 51

USING qSOFA AS SCREENING CRITERIA FOR SEPSIS AND SEPTIC SHOCK DELAYS IDENTIFICATION AND TREATMENT IN PATIENTS PRESENTING THROUGH THE EMERGENCY DEPARTMENT

Omar K. Danner* MD, Leslie R. Matthews MD, Jonathan Nguyen DO, K A. Bashan-Gilzenrat MD, Kahdi Udobi* MD, Assad Taha MD,Ph.D., Dan Wu MD, Bhavin Adhyaru MD, MS, Carmen Polito MD, MSc, Sherika Kimbrough RN, MSN, Brooks Moore MD, Sandra Hendren BS, MS, Peter Rhee* MD,MPH, Ed W. Childs* MD, Morehouse School Of Medicine

Introduction: Enhancing the efficiency of identification and treatment of severe sepsis has been shown to improve the outcomes of septic patients. Timely diagnosis is essential to early institution of empiric antibiotics and fluid resuscitation. Quick Sequential Organ Failure Assessment (qSOFA) scoring has been suggested as a useful screening tool in septic patients at higher risk death. We hypothesize that qSOFA is a poor screening tool for sepsis and significantly decreases accuracy and delays timeliness of detection in emergency department (ED) patients.

Methods: We evaluated the records of 116,227 ED patients from a large, urban teaching hospital between January and December 2014. The qSOFA Criteria (SBP $\leq$ 100 mm Hg, RR $\geq$ 22, and/or GCS $\leq$ 14) were compared to SIRS criteria for sepsis prediction. There were 1991 patients with discharge diagnoses of sepsis, severe sepsis, and/or septic shock.

Results: Variations in three presenting variables, respiratory rate, systolic BP and mental status were not determined to be primary early predictors of sepsis with a 7.94% (158/1991) accuracy compared to 33% (657/1991) using SIRS criteria ($p < 0.0001$) in confirmed septic patients. Only 5.37% (508/9463) to the total ED population met $\geq$ 2 qSOFA criteria.

Conclusion: Using qSOFA decreases the accuracy and expediency of sepsis identification and treatment in septic ED patients. This initial screening approach may lead to delayed sepsis workup and hinder life-saving interventions in ED patients to a greater extent than using SIRS vital signs criteria due its poor diagnostic sensitivity.

Poster # 52

Bioelectrical Impedance Analysis Guided-Fluid Management Promotes Fascial Closure of Open Abdomen: A Retrospective Cohort Study

Kai Wang MD,Ph.D., Jieshou Li* Sr., MD,Ph.D., Research Institute Of General Surgery, Jinling Hospital, Medical School Of Nanjing University

Introduction: High volume fluid therapy in open abdomen (OA) trauma patients contributes to excessive visceral edema, delayed fascial closure, and prolonged parenteral nutrition. Thus, we investigated whether bioelectrical impedance analysis-directed resuscitation reduced postoperative fluid overload, promoted earlier fascial closure, and improved outcomes in OA trauma patients.

Methods: A retrospective cohort study was performed for all trauma patients requiring OA admitted between 05/2013–04/2015 to a national gastrointestinal referral center. Patients were divided into two groups: BIA-directed fluid resuscitation (BIA) and traditional fluid resuscitation (TRD). Data for patients were collected and retrospectively analyzed.

Results: Forty-eight patients were included (N=30, BIA; N=18, TRD). Fluid resuscitation with BIA allowed cumulative fluid balance and fewer complications. BIA patients were significantly more likely to achieve primary fascial closure (PFC) [HR 8.73 (95 % CI, 2.70-28.26); $p < 0.001$] and survive [HR 0.03 (95 % CI, 0.001-0.81); $p = 0.036$] than TRD patients did. Resuscitation guided by BIA reduced time to PFC, enteral nutrition (EN) initiation and volume of postoperative 7-day cumulative fluid balance, by an average of 4.28 days ($p < 0.001$), 6.01 days ($p < 0.001$), and 6775.94 ml ($p < 0.001$), respectively.

Conclusion: For trauma patients undergoing OA, BIA-directed fluid resuscitation is associated with lower postoperative fluid overload and 30-day mortality, higher 30-day PFC, earlier fascial closure and initiation of EN. Thus, BIA may be routinely used for OA trauma patients.

Poster # 53

TO FEED OR NOT TO FEED: ENTERAL FEEDING AND PREOPERATIVE NPO STATUS AMONG ADULT TRAUMA ICU PATIENTS

Ronit Bassa DO, Jan Leonard MSPH, Denetta S. Slone* MD, Emmett L. McGuire MD, Matthew M. Carrick* MD, Robert Madayag MD, Allen H. Tanner II, MD, David Bar-Or MD, Swedish Medical Center

Introduction: For patients in the intensive care unit (ICU), the prevalence of malnutrition has been estimated at 38-78% and has been independently associated with increased ICU lengths of stay (LOS), ICU readmissions, infection, and mortality. Nutrition therapy is an important component of in-hospital treatment but is often interrupted prior to surgical procedures to prevent perioperative pulmonary aspiration and subsequent complications, such as pneumonia and respiratory compromise. Guidelines on enteral feeding and preoperative fasting in the trauma ICU patient vary by hospital. Our objective was to compare the safety of enteral feeding protocols among trauma ICU patients undergoing surgical procedures at four Level I Trauma Centers.

Methods: Adult (≥18 years) trauma patients admitted to the ICU were included in this multicenter, retrospective cohort study if they had a cuffed endotracheal tube/ tracheostomy and received tube feedings prior to operative management of a traumatic injury (June 2016 - May 2017). Patients were excluded if their surgical procedure was on the abdomen, in the prone position, a manipulation of the airway, or a tracheostomy or percutaneous endoscopic gastrostomy at the bedside. Hospitals A and B fed patients until being called to the operating room, Hospital C kept patients nil per os (npo) for at least 4 hours prior to surgery, and Hospital D did not have a formal enteral feeding protocol, but on average kept patients npo for 8 hours before surgery. Clinical characteristics and outcomes (primary: aspiration; secondary: hospital and ICU LOS, in-hospital mortality) were obtained from each hospital's trauma registry and through chart review. An intent-to-treat analysis was conducted using Chi-square and Kruskal Wallis tests to examine differences between patients at each hospital.

Results: Fifty-seven patients were included in the study, of which 18 (32%), 14 (25%), 19 (33%), and 6 (11%) were from Hospitals A, B, C, and D, respectively. Patients had a median age of 57 years, were primarily male (77%) and had a median injury severity score (ISS) of 22. Surgical procedures were primarily orthopedic/spine (37%) followed by neurosurgery (12%) and open reduction internal fixation of the face (11%). There were no differences in age, sex, ISS, the number of days with a feeding tube or the number of days on a ventilator between hospitals. Patients at Hospital C had significantly more pneumonia (p=0.02), but no differences were observed in aspiration, hospital and ICU LOS, or mortality (Table).

Characteristics and Outcomes of Mechanically Ventilated, ICU Patients with Feeding Tubes prior to a Surgical Procedure (n=57)

	Hospital A (n=18)	Hospital B (n=14)	Hospital C (n=19)	Hospital D (n=6)	p-value
Age	52 (27-59)	44 (33-58)	61 (38-70)	59 (56-67)	0.51
Male	13 (72%)	11 (79%)	15 (80%)	5 (83%)	0.97
ISS	29 (17-38)	18 (14-29)	19 (13-24)	30 (17-50)	0.13
Days with a feeding tube	15 (9-20)	22 (16-27)	14 (9-21)	14.5 (6-19)	0.12
Days on a ventilator	11.5 (9-19)	13.5 (10-17)	12 (8-14)	11 (5-21)	0.83
Aspiration	1 (6%)	1 (7%)	3 (16%)	0 (0%)	0.78
Any Pneumonia	3 (18%)	2 (14%)	11 (58%)	2 (33%)	**0.02**
Aspiration	0 (0%)	0 (0%)	3 (27%)	0 (0%)	
Ventilator Associated	0 (0%)	0 (0%)	5 (45%)	1 (33%)	
Hospital Acquired	1 (33%)	2 (100%)	3 (27%)	0 (0%)	
Community Acquired	2 (67%)	0 (0%)	0 (0%)	2 (67%)	
ICU Length of Stay	15.5 (11-21)	19.5 (13-28)	15 (10-21)	14.5 (11-21)	0.37
Hospital Length of Stay	30.5 (17-50)	27.5 (24-33)	22 (15-27)	18.5 (16-21)	0.09
In-hospital Mortality	5 (28%)	1 (7%)	3 (16%)	0 (0%)	0.35

*Data are presented as n (%) or median (IQR)

Conclusion: Continuing enteral feeding up until a surgical procedure in patients with a cuffed endotracheal tube/tracheostomy did not lead to more complications than in patients who were npo prior to surgery and could benefit the patient in reaching their daily nutrition goals.

Poster # 54

The usefulness of diameter and collapse index of inferior vena cava as a clinical indicator of resuscitation for critically ill hypotensive patients.

Seongpyo Mun MD,Ph.D., Department Of Surgery, Chosun University, School Of Medicine

Introduction:Fluid therapy is one of the most important management for critically ill hypotensive patients. Diameter of inferior vena cava and collapse index (DCIIVC), how much it is collapsed during respiratory cycle that is checked by ultrasound, is known to reflect patient's intravascular volume status and fluid responsiveness well. We wanted to evaluate the clinical outcomes of using DCIIVC as a tool of point of care for resuscitation in critically ill hypotensive patients by prospective observational study. **Methods**:Hypotensive patients admitting to ICU between May 2017 and October 2017 were enrolled. The inclusion criteria were age between 17 and 70, systolic blood pressure < 90 mmHg and abnormal DCIIVC. DCIIVC group used DCIIVC as a guide for resuscitation until DCIIVC became normal. The total amount and infusion rate of resuscitation was 20 ml/kg and 300 ml/hour. In Non DCIIVC group fluid therapy was done by physician's decision. Clinical outcomes were compared. **Results**: Among 612 patients, 30 patients were allocated to each group. The average age of DCIIVC vs Non DCIIVC group was 64 vs 66 years old. Male and female ratio was 17:13 vs 19:11. Main causes of admission were pneumonia, exacerbation of chronic obstructive lung disease, cerebrovascular accident, post-major surgery, abdominal infection, major trauma, unknown hypotension, heart failure, Dengue fever, major burn and complication of liver cirrhosis. There were six major trauma patients; two epidural hematoma, one liver injury, one spleen injury, one pelvic bone fracture and one multiple long bone fracture. Injury severity score of each group was 17.2 vs 18.1. Mean systolic pressure at admission was 83 vs 81 mmHg. Mean diameter of IVC was 18.9 vs 18.3 mm. Mean collapse index of IVC was 67 vs 64%. Total amount of fluid input (TAFI) in 24 hours was 3,560 vs 4,130 ($p<0.05$). TAFI in 48 hours was 6,910 vs 8,420 ($p<0.01$). Lactate at admission, 24 hours and 48 hours after admission were 3.8 vs 4.1, 3.1 vs 3.2 and 2.1 vs 1.9 respectively. Mean duration of mechanical ventilation, ICU stay, hospital stay was 4.5 vs 4.1, 6.3 vs 7.2, 17.2 vs 18.1 respectively. Overall mortality was 13.3 vs 16.7 % (Table 2). Except TAFI, there was no statistical difference. **Conclusion**:DCIIVC can be checked easily and used as a tool of point of care of resuscitation for critically ill hypotensive patients. Using DCIIVC as a guide of resuscitation helps physician to infuse fluid restrictively without adverse outcomes.

Characteristics	DCIIVC group (N=30)	Non DCIIVC group (N=30)	P
Total amount of fluid input in 24 hours (ml)	3,560	4,130	<0.05
Total amount of fluid input in 48 hours (ml)	6,910	8,420	<0.01
Lactate at admission (mmol/L)	3.8(2.5-4.4)	3.5(2.1-4.2)	NS
Lactate in 24 hours (mmol/L)	3.1(2.1-3.2)	3.2(2.2-3.6)	NS
Lactate in 48 hours (mmol/L)	2.1(0.6-2.8)	1.9(0.7-2.8)	NS
Duration of mechanical ventilation (days)	4.5(1-14)	4.1(1-11)	NS
Duration of ICU stay (days)	6.3(2-21)	7.2(2-19)	NS
Duration of hospital stay (days)	17.2(7-35)	18.1(11-45)	NS
Mortality (%)	4(13.3)	5(16.7)	NS

Table 2. Clinical outcomes. DCIIVC diameter and collapse index of inferior vena cava; ICU intensive care unit;

Poster # 55

THE POSITIVE PHYSICAL EXAMINATION DOES NOT ALWAYS INDICATE THE REQUIREMENT OF ENDOTRACHEAL TUBE INTUBATION IN PATIENTS WITH FACIAL BURN

Ruo-Yi Huang MD, Yen-Chang Hsiao MD, Chang Gung Memorial Hospital

Introduction: The non-objective standards such as “physical examination”, “burn sites” as well as “clinical evaluation” are usually used to determine the necessity of airway protection for facial burn patients in the emergency department (ED). However, the possibility of unnecessary intubation or delayed dyspnea after admission exists. The objective criteria for airway protection of facial burn patients are required.

Methods: A large series of facial burn patients between January 2013 and May 2016 was reviewed. These patients’ findings of physical examinations and laboratory data were analyzed. All intubated patients received routine bronchoscopy for evaluation of the airway injury. The comparisons were performed in patients with and without proved airway injury. The reasons of intubation in patients without airway injury were also delineated.

Results: During the study period, there were 335 facial burn patients. A total of 121 patients received intubation in ED, 73 of them were later proved to have suffered airway injury by bronchoscopy. In other words, there were 40% (48/121) intubated patients without evidence of airway injury. Although patients with airway injury had significantly higher TBSA (27% vs. 9%), higher ISS (16 vs. 6), higher probability of positive physical examination and higher probability of abnormal laboratory test than patients without airway injury. Multivariate logistic regression revealed that only TBSA, injury severity score (ISS) and PH of arterial blood gas have independently relevance to necessity of airway protection. Elevation of one unit of TBSA and ISS independently results in elevation of intubation requirement at 2.8% and 11.9% respectively.

Conclusion: In the management of the patients with facial burn, the conventional indication which based on physical examination should be reconsidered. The TBSA and other associated injuries (ISS) play important roles in the decision of the patients who required endotracheal tube or not in ED.

Facial burn patients with and without airway injury (proved by bronchoscopy)

	Airway injury			Multivariate logistic regression	
	With (N=121)	Without (N=214)	*p*-value	Odds ratio	*p*-value*
SBP in ED (mmHg)	154	155	0.652$	-	-
GCS in ED	14	15	<0.001$	-	0.609
TBSA (%)	27	9	<0.001$	1.028	<0.05
ISS	16	6	<0.001$	1.119	<0.05
Confined space (N, %)	24(69%)	11(31%)	<0.001#	-	0.091
Laboratory test					
PH	7.3	7.4	<0.001$	0.025	<0.05
$PaCO_2$ (mmHg)	38.2	36.5	0.175$	-	-
PaO_2 （mmHg）	157.7	93.5	<0.001$	-	0.352
Sat (%)	90.5	96.4	0.315$	-	-
HCO^3 (mm/L)	21.2	23.4	<0.001$	-	0.942
HbO_2 (%)	88.4	89.7	0.537$	-	-
$HbCO$ (%)	3.4	2.2	0.08$	-	-

$ Student T test # Chi-square test * Multivariate logistic regression

Poster # 56

ECHO IS A GOOD, NOT PERFECT, MEASURE OF CARDIAC OUTPUT IN CRITICALLY ILL SURGICAL PATIENTS

Peter P. Olivieri MD, Rajan Patel BS, Stephanie L. Kolb MD, Syeda Fatima RDCS, Samuel M. Galvagno* Jr., DO,Ph.D., Daniel J. Haase MD, Daniel Herr MD, David A. Bruno MD, Thomas M. Scalea* MD, Sarah B. Murthi MD, RDCS University of Maryland Medical Center

Introduction: Measurement of cardiac output (CO) is integral to the management of critically ill patients. In comparison to a pulmonary artery catheter (PAC) critical care transthoracic echo (TTE) has been shown to have excellent agreement in the measurement of CO in non-surgical populations. Our hypothesis is that the feasibility and accuracy of TTE CO relative to PAC is different in surgical and non-surgical patients.

Methods: Surgical Intensive Care Unit (ICU) patients (SP) with a PAC placed for hemodynamic monitoring and nonsurgical patients (NSP) undergoing PAC right heart catheterization in the echocardiography lab were prospectively enrolled. CO was measured simultaneously by PAC thermodilution and TTE. For TTE, pulsed wave Doppler of the left ventricular outflow tract (LVOT) velocity time integral (VTI) and LVOT diameter (LVOTd) are used to assess CO. Pearson coefficients are used to assess correlation. Bland-Altman analysis is used to determine agreement. Bias, limits of agreement (LOAs), and percentage error (PE) are determined.

Results: Over 18 month period 81 patients were enrolled (50 SP, 31 NSP). In SP CO be measured in 68% (34/50) vs 78% (26/38) $p<0.002$ in NSP. Inability to measure LVOTd was the primary reason for failure to measure CO (15/16, 5/7, $p=0.69$). VTI could be measured in all patients. The correlation between PAC and TTE measurement is strong in both groups; SP (r 0.76, $p<0.001$), NSP (r 0.86, $p<0.001$). In SP and NSP agreement was moderate and similar between groups. Bland-Altman analysis demonstrated a bias of -0.1 L/min, LOAs of -2.5 and 2.3 L/min, and PE of 40% for SP. For NSP Bland-Altman analysis demonstrated a bias of 0.4 L/min, LOAs of -1.8 and 2.5 L/min, and PE of 40%.

Conclusion: TTE demonstrates strong correlation and only moderate agreement in both surgical and non-surgical patients. The feasibility is lower in SP primarily because of inability to measure the LVOTd. Currently, it is reasonable to use TTE as a measure of CO in surgical ICU patients. Further research is needed to simplify, automate, and remove the need to measure LVOTd to advance the critical care TTE in the Surgical ICU.

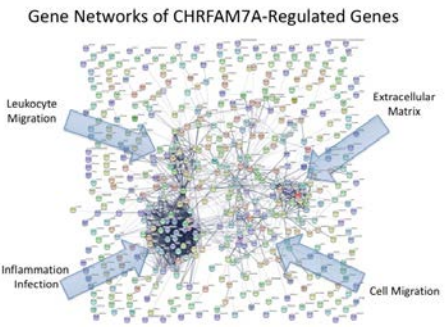
Poster # 57

MODULATION OF THE α-7 NICOTINIC ACETYLCHOLINE RECEPTOR CONTRIBUTES TO VARIABILITY IN THE HUMAN INFLAMMATORY RESPONSE TO INJURY

Theresa W. Chan MD, Elliot C. Williams MD, Brian P. Eliceiri Ph.D., Andrew Baird Ph.D., Todd W. Costantini* MD, University of California, San Diego

Introduction: The α-7 nicotinic acetylcholine receptor (α7nAChR), encoded by the CHRNA7 gene, mediates the anti-inflammatory response to injury. Only humans possess the CHRFAM7A gene that acts to inhibit α7nAChR-mediated anti-inflammatory signaling. We have previously shown that there is significant individual variability in CHRFAM7A expression in human leukocytes. The ability of CHRFAM7A to alter the macrophage inflammatory response is unknown. Here, we hypothesized that expression of CHRFAM7A alters macrophage inflammatory gene expression.

Methods: THP-1 cells were differentiated with PMA and cultured to form mature macrophages *in vitro*. Lentiviral transfection of the human CHRFAM7A gene was performed prior to differentiation. CHRFAM7A expressing macrophages (n=6) were compared to vector macrophages (n=6) using RNA sequencing analysis for changes in global gene expression, clustering analysis, and enriched pathway analysis to identify changes in relevant biological pathways.



Results: CHRFAM7A expression in cultured macrophages altered the expression of over 5,000 genes. Heat map analysis demonstrated changes in global gene expression in CHRFAM7A transfected cells compared to vector. Gene expression pathways related to focal adhesion and cell-cell adhesion were most significantly upregulated in CHRFAM7A expressing cells. Clustering network analysis demonstrated that forced expression of CHRFAM7A regulates biological pathways related to inflammation, extracellular matrix, and leukocyte migration.

Conclusion: The uniquely-human gene CHRFAM7A alters macrophage gene expression in pathways related to the injury response. Based on human variability in CHRFAM7A expression, CHRFAM7A may contribute to individual variability in the inflammatory response to injury.

Poster # 58

MULTIMODAL ANALGESIA DECREASES OPIOID USE IN CRITICALLY ILL TRAUMA PATIENTS

Kasey L. Hamrick PharmD, Carl A. Beyer MD, Jin A. Lee PharmD, Joseph M. Galante* MD, Christine S. Cocanour* MD, Jeremiah J. Duby PharmD University of California, Davis

Introduction: Opioids are the mainstay of treatment for pain in critically ill trauma patients. However, the risks of opioid use, including over-sedation, respiratory depression, and the development of chronic dependence, mandate a different approach. Multimodal analgesia employs a combination of narcotic and non-narcotic agents with different mechanisms that have synergistic effects in treating pain. This study examines the effect of implementing a multimodal pain management order set on the opioid requirements of critically ill trauma patients.

Methods: This was a pre-post cohort study of adult trauma ICU patients before and after the implementation of a multimodal pain management order set. The pre-group and post-group included consecutively admitted patients from September to December in 2015 and 2017, respectively. Patients were excluded if their hospital stay was less than five days, head abbreviated injury scale score was greater than one, or pre-injury medications included methadone or buprenorphine. The total oral morphine equivalent (OME) dose was calculated for each 24-hour period on the 2 nd through 5th days of admission and the last 24 hours prior to discharge using standardized ratios.

Results: There were 65 patients in the pre-group and 62 in the post-group. There were no differences between groups in injury severity score (14.3±1.2 vs 13.3±1.3, p=0.58), sequential organ failure assessment score (4.2±0.4 vs 4.8±0.4, p=0.29), or number of surgeries within the initial five days of hospitalization (1±0.1 vs 1±0.2, p=0.74). As shown in the table, patients on multimodal pain management had significantly lower median OME doses on hospital days two through five. There was also a trend towards significance in the 24-hour period prior to discharge. More patients in the post-group received scheduled acetaminophen, gabapentin, lidocaine patches, and methocarbamol compared to patients in the pre-group. There was a trend towards lower mean pain scores in the post-group during hospital day five (4.5±0.3 vs 3.5±0.4, p=0.06) although there was no difference in mean pain scores at hospital discharge between the groups (3.4±0.3 vs 3.6±0.3, p=0.79).

	Median Oral Morphine Equivalent Dose, mg					Number of Patients on Multimodal Medication, n (%)			
	Day 2	Day 3	Day 4	Day 5	Prior to Discharge	Scheduled Acetaminophen	Gabapentin	Lidocaine Patch	Methocarbamol
Pre-Group	114	114	100	105	47	21 (32%)	12 (18%)	6 (9%)	0 (0%)
Post-Group	40	33	26	30	30	59 (95%)	38 (61%)	34 (55%)	8 (13%)
***p* Value**	0.006	<0.001	<0.001	0.017	0.067	<0.001	<0.001	<0.001	0.003

Conclusion: The implementation of a multimodal pain management order set significantly reduced the total daily OME dose in critically ill trauma patients without compromising patient comfort. Multimodal analgesia is an important tool to reduce opioid exposure in this patient population.

Poster # 59

THE ANTI-INFLAMMATORY EFFECT OF LMWF5A AND N-ACETYL KYNURENINE ON MACROPHAGES: INVOLVEMENT OF ARYL HYDROCARBON RECEPTOR IN MECHANISM OF ACTION

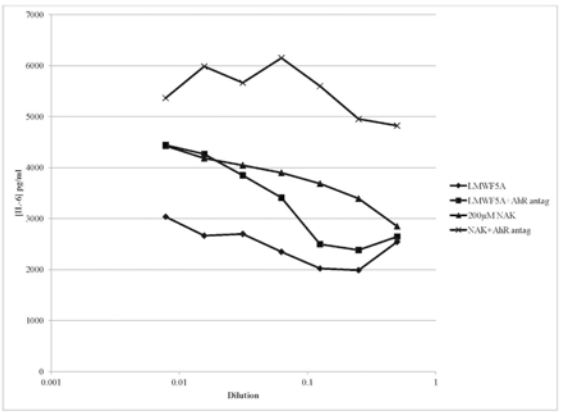
Leonard Rael MS, Charles Mains* MD, Matthew Carrick* MD, Allen Tanner MD, Mark Lieser MD, David Acuna DO, David Bar-Or MD, Swedish Medical Center

Introduction: After a traumatic insult, macrophages can become activated leading to general inflammation at the site of injury. Activated macrophages are partially regulated by the aryl hydrocarbon receptor (AhR) which when activated suppresses inflammation by limiting the secretion of pro-inflammatory cytokines and promoting the over expression of immuno-modulatory mediators. This study aims to determine whether the low molecular weight fraction of 5% human serum albumin (LMWF5A) and N-acetyl kynurenine (NAK), a breakdown product in LMWF5A, can regulate inflammation by inhibiting macrophage activation through the AhR.

Methods: A human peripheral blood monocyte cell line (THP-1) was differentiated into macrophages using phorbol 12-myristate 13-acetate (PMA). After a 3 day differentiation period, macrophages were pre-treated with 2-fold dilutions of LMWF5A or synthetic NAK (200μM) with or without an AhR antagonist (10μM CH223191) for 1 hour prior to overnight stimulation with lipopolysaccharide (LPS). Supernatants were assayed by ELISA for the pro-inflammatory cytokines IL-6 and CXCL-10.

Results: THP-1 cells were differentiated for 3 days into macrophages as evidenced by adherence to tissue culture plates and other morphological changes such as increases in size and development of vesicles associated with phagocytosis. More importantly, treatment of LPS-stimulated, differentiated THP-1 cells with LMWF5A caused a 50-60% decrease in IL-6 release throughout the dilution series. A dose-response inhibition of IL-6 release was observed for NAK with maximal inhibition (50%) seen at the highest NAK concentration of 200μM. Finally, an AhR antagonist partially blocked the anti-inflammatory effect of LMWF5A while completely blocking the effect of NAK. A similar effect was observed for CXCL-10, but the AhR antagonist was not as effective suggesting additional mechanisms for CXCL-10 release.

Conclusion: These findings suggest that LMWF5A and a breakdown component (NAK) partially promote the suppression of activated macrophages via the AhR receptor. Known AhR agonists include kynurenine and kynurenic acid. Therefore, LMWF5A, which contains NAK, is potentially a useful therapeutic in medical conditions where inflammation is prevalent such as trauma, sepsis, and wound healing.



Poster # 60

CERVICAL SPINE FRACTURES AND SWALLOWING DYSFUNCTION IN TRAUMA PATIENTS TREATED WITH SEMI-RIGID COLLARS: OUR INSTITUTIONAL EXPERIENCE

Maryann I. Mbaka MD, Megan Parrott MD, Alyssa Good CCC-SLP, Leah Galluzzi CCC-SLP, Mark Jones* MD, Jeremy Reeves MD, Raymond Bynoe MD, Unversity Of South Carolina

Introduction: The decision to feed patients with cervical spine injuries necessitating cervical spine immobilization is something that each provider must decide. In this study, we set out to investigate the rates of dysphagia and aspiration in the presence of cervical spine semi-rigid collars. We hypothesize that the presence of cervical collars will increase the incidence of dysphagia and aspiration in patients with cervical spine injuries.

Methods: Trauma patients at a level 1 trauma center from January 1, 2013 – December 31, 2015 were analyzed retrospectively via the trauma registry. We included patients with isolated cervical spine injuries treated with semi-rigid cervical collar and evaluated by speech-language pathologist (SLP) for dysphagia and aspiration. This resulted in 319 patients. We excluded patient with head injuries, those less than 18years old, penetrating trauma, and gravid patients.

Results: Of the 319 patients with cervical spine fracture who met the inclusion criteria, 268(84%) were evaluated by SLP prior to collar removal. 158(62%) of patients meeting the inclusion criteria and were evaluated by SLP prior to collar removal were found to have dysphagia on evaluation. 37% of patients meeting the inclusion criteria and were evaluated by SLP prior to collar removal were found to have aspiration during evaluation. Dysphagia is associated with longer hospital stay ($p < 0.001$) and longer ICU stay ($p < 0.005$). Other variables associated with increased dysphagia and aspiration rates include increased age and injury severity score (ISS).

Conclusion: Patients with cervical spine fractures treated with semi-rigid cervical collars show high rate of dysphagia (62%) and aspiration (37%). This outlines the need for formal swallowing assessments in this population by SLP. In addition, as these resources can often be limited those patients with higher ISS and advanced age should be high priority for screening. If dysphagia and aspiration risk can be identified and mitigated sooner it is possible ICU and overall hospital length of stay could be affected.

Poster # 61

USING ARTERIAL PRESSURE INDEX TO PREDICT ARTERIAL INJURIES IN PENETRATING TRAUMA TO THE UPPER EXTREMITIES

Lily Tung MD, Mark J. Seamon* MD, Elizabeth Dauer MD, Jesse Passman BS, Caitlin Fitzgerald MD, Brone Lobichusky BA, Michael Mazzei MD, Wendy Rodriguez BS, Randi N. Smith MD,MPH, Emory University

Introduction: In trauma patients, arterial pressure indexes (API) are used to predict the need for computed tomography angiogram (CTA) to evaluate for lower extremity vascular injuries. Due to collateral circulation in the upper extremities (UE), the diagnostic algorithm for UE is less clear. We hypothesized that unlike its use in the lower extremities, API cannot be used to predict arterial injury in the UE.

Methods: A multi-institutional retrospective review of adults with penetrating UE trauma (defined as injury from the deltopectoral groove to wrists) and documented APIs from 2006 to 2016 was performed at three, urban, level I trauma centers. Patient demographics, injury severity score (ISS), APIs, CTA results, and operative findings were recorded. CTA was used as the gold standard and was considered positive for injury if thrombus, occlusion, dissection, extravasation, pseudoaneurysm or arteriovenous fistula (AVF) was identified. Sensitivity, specificity, positive and negative predictive values (PPV and NPV) of API <0.9 in detecting UE arterial injuries were calculated.

Results: 222 patients met inclusion criteria. 88.5% were male and median age was 27.5 years (IQR 22–37). Gunshot wounds comprised 76.6%, stab wounds 17.9%, and other mechanisms, such as dog bites, 5.5%. The median ISS was 9 (IQR 2–10) and median API was 1 (IQR 0.93-1). 35 (16.1%) patients had signs of vascular injury, 53 (24.3%) had associated fractures, and 26 (11.9%) had concomitant nerve or tendon injuries. Injuries seen on CTA included thrombus or occlusion (9.7%), transection (4.2%), dissection (2.8%), extravasation (1.4%), pseudoaneurysm (1.4%), or AVF (1.4%). Vascular injuries on operative exploration included ulnar (34.4%), brachial (25%), and radial artery (12.5%). Sensitivity and specificity of API<0.9 for identifying arterial injury was poor (69% and 69%, respectively).

Conclusion: API should be used with caution to determine arterial injury in UE after penetrating trauma.

Table 1. Sensitivity, specificity, PPV, NPV of API <0.9 in detecting named upper extremity arterial injuries

	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)
All injuries, %	69.2 (38.6-90.9)	69.5 (56.1-80.8)	33.3 (22.8-45.9)	91.1 (81.7-95.9)
Brachial artery, %	66.7 (9.4-99.2)	63.8 (51.3-75)	7.4 (3.3-15.9)	97.8 (89.8-99.6)
Radial artery, %	66.7 (9.4-99.2)	63.8 (51.3-75)	7.4 (3.3-15.9)	97.8 (89.8-99.6)
Ulnar artery, %	60 (14.7-94.7)	64.2 (51.5-75.5)	11.1 (5.4-21.5)	95.6 (87.9-98.5)

Poster # 62

IN THEIR OWN WORDS: PERSPECTIVES FROM THE SENIOR VISITING SURGEON PROGRAM

Joseph M. Galante* MD, Raymond Fang* MD, David Zonies* MD,MPH, Todd E. Rasmussen* MD, AAST Military Liaison Committee

Introduction: In an effort to facilitate military and civilian collaboration, the American Association for Surgery of Trauma (AAST) and American College of Surgeons (ACS) developed the Senior Visiting Surgeons (SVS) Program. Civilian experts in trauma surgery worked alongside military surgeons at Landstuhl Regional Medical Center (LRMC) in Landstul, Germany. We attempted to elucidate and codify the benefits of the program through an oral history from the program's participants.

Methods: A qualitative study was conducted with civilian SVS and their military counterparts. Civilian surgeons were identified through the AAST/ACS database. Military surgeons were identified through interviews with civilian surgeons. A single semi-structured interview was conducted with SVS. All interviews were recorded. A thematic array was constructed and relevant themes were organized into categories.

Results: There were 46 SVS indentifed. Each visiting surgeon went to LRMC for an average of two weeks between 2006 and 2014. Eleven (24%) civilian surgeons agreed to be, and were, interviewed. Five military surgeons were also interviewed. Four common themes were identified through the civilian interviews. The first and most common was humility. Humility was best exemplified through the quote: "I thought I knew trauma but I was humbled but the efforts of the military given the catastrophic injuries". The second theme was admiration. "The young military surgeons and their teams were motivated and delivered high quality care". The third theme was identifying techniques which were taken and implemented into civilian practice. "I ended up adopting the blood transfusion strategies I saw in Landstuhl at my hospital". Finally there was a strong desire to do more for the military. "If they would have me, I would put on the uniform and serve". The military perspective was predominatly one of appreciation for the support and input from the SVS. "It was great to have these well known surgeons there just helping out". A downside was the feeling that the SVS could occasionally disrupt the normal workflow.

Conclusion: The SVS program strengthened the historical relationship that has long existed between military and civilian surgeons and emphasized the importance of continued clinical collaboration. The program allowed the civilian surgeons to gain a better understanding of the challenges military surgeons face, fostered a sense of appreciation and resulted in valuable clinical exchanges. Sustaining the SVS program not only benefits military and civilian surgeons, but can help lead the way for future partnerships in direct support of the Misson Zero Act.

Poster # 63

CHANGING OUTCOMES IN ABDOMINAL VASCULAR INJURIES OVER TIME

Caitlin A. Fitzgerald MD, Yasmin F. Tootla MD, Christopher J. Dente* MD, Dipan C. Patel MD, Emory University

Introduction: The incidence of major vascular injury in patients presenting with abdominal trauma ranges from 5% to 25% and is frequently the ultimate cause of death in this patient population. The management of abdominal vascular trauma is complex and is currently determined by both the severity of the injury and the anatomic location of the injured blood vessel. Furthermore, patients with an abdominal vascular injury oftentimes present hypotensive with significant physiologic derangements secondary to acute blood loss and numerous associated injuries. The purpose of this study was to evaluate the current epidemiology and management patterns of traumatic abdominal vascular injuries at an urban level I trauma center.

Methods: This was a retrospective chart review of all patients presenting to an urban level I trauma center with an injury to a named intra-abdominal blood vessel from 2009 to 2017. This cohort of patients was then compared to a previous cohort of patients from our institution who presented between 1989 and 1998. Data collected included demographics, type and location of injury, and management strategies. Outcome measures included mortality and post-operative complications.

Results: A total of 321 patients met inclusion criteria for this study. Of these, the vast majority of patients were male (261/321, 81.3%) and the average age was 34.8 ± 15.1 years of age. Overall mortality was 29.9% (96/321) and 33 patients (34.4%) died prior to definitive vascular repair. Similar to previously published data out of our institution, 40.5% (130/321) of patients presented with injuries to more than one named abdominal blood vessel. Within the current cohort, the incidence of various types of trauma included 177 gunshot wounds (55.1%), 62 motor vehicle crashes (19.3%), and 32 stab wounds (10.0%). The most common post-operative complications included pneumonia (74/321, 23.1%), organ space infections (60/321, 18.9%), and sepsis (56/321, 17.4%). The most commonly injured vessels continue to include the inferior vena cava (77/508, 15.2%), common iliac vein (49/508, 9.6%), aorta (43/508, 8.5%), and external iliac vein (30/508, 5.9%). When considering trends in mortality over time, patients in the current cohort who presented with an arterial injury demonstrated an improvement in survival (69.4% vs. 46.0%) whereas patients with venous injuries have demonstrated similar survival over time (65.6% vs. 64.0%). Interestingly, while there are similar rates of exsanguination prior to repair in arterial injuries (10.2% vs. 13.3%), venous injuries appear to be associated with an increase in death prior to repair in the current cohort (12.8% vs. 5.0%).

Conclusion: To our knowledge, this represents one of the largest reviews of intra-abdominal vascular trauma in the current era. Although intra-abdominal vascular injuries remain a significant source of morbidity within the trauma population, mortality from these injuries appears to be improving over time, a trend which may be the result of both improved pre-hospital care and resuscitation practices.

Poster # 64

MAJOR VENOUS INJURY AND LARGE VOLUME CRYSTALLOID RESUSCITATION: A LIMB THREATENING COMBINATION

Elizabeth D. Dauer MD, Seiji Yamaguchi MD, Kathryn Kelly BS, Daohai Yu Ph.D., Xiaoning Lu MS, John Sharpe MD, Nathan Manley MD,MPH, John Harvin* MD, Ethan Taub DO, Anna Goldenberg-Sandau DO, Krishan Patel MD, Ellen Omi MD, Hassan Mashbari MD, Jennifer Hartwell* MD, Jason Brocker MD, Temple University Hospital

Introduction:After major venous injury (MVI), there is still a risk of late compartment syndrome (LCS). The contribution of intraoperative resuscitative efforts in patients with hemorrhagic shock to the development of LCS are not well defined. We hypothesized that initial hemodynamic instability, intraoperative large volume crystalloid resuscitation (LVR) or massive transfusion (MT) does not increase the risk of LCS or amputation after MVI.

Methods:We conducted a multi-institutional retrospective review of patients with injury to the Inferior Vena Cava, External Iliac Vein, Common Iliac Vein and/or Femoral Vein from 2005-2015 at seven centers. The outcome of interest was the development of LCS and need for amputation

Results:478 patients met inclusion criteria. 214 (44.8%) patients underwent lower leg fasciotomy at the index procedure of which 107 (50%) had LVR, 97 (45.3%) had MT, 99 (46.3%) had an abnormal heart rate, and 76 (35.5%) were hypotensive. LCS of the lower leg occurred in 26 (9.8%) of the remaining 264 patients. LVR (OR=1.55, p=0.39), MT (OR=1.03, p=1.00), abnormal HR (OR=1.39, p=0.49), and hypotension (OR=1.03, p=1.00) did not significantly increase risk for LCS. Only non-African American race (OR=2.95, p=0.01) was found to be a predictor of LCS. Overall, 31 patients with MVI required amputation. LVR ($p<0.001$), combined arterial/venous injury (p=0.001), and associated fracture (p=0.001) were individual risk factors for amputation, while penetrating wound and abnormal HR were implicated as well (p=0.06 and 0.09, respectively). MT was not shown to increase risk (p=0.44). A multiple logistic regression model demonstrated that patients receiving LVR (OR (95% CI): 9.7 (2.9-33.0); $p<0.001$), with combined arterial/venous injury (3.6 (1.4-9.2); p=0.006), and with an associated fracture (3.2 (1.4-7.1); p=0.004) were more likely to require amputation.

Conclusion:Patients presenting in hemorrhagic shock, or who undergo LVR or MT do not have a significantly increased risk of LCS after MVI. Patients who receive LVR, have combined arterial/venous injuries and have associated fractures are more likely to require amputation. Further prospective studies are warranted to clarify the role of resuscitation in the development of LCS.

Poster # 65

THE SIXTY MINUTE MYTH OF FIRST PHASE DAMAGE CONTROL SURGERY

Alison Smith MD,Ph.D., Lynn Hakki BS, Riley Santiago BS, BA, Rebecca Schroll MD, Chrissy Guidry DO, Patrick McGrew MD, Clifton McGinness MD, Danielle Tatum Ph.D., Juan Duchesne* MD, Tulane School of Medicine

Introduction: Damage Control Surgery (DCS) traditionally involves limiting operating room (OR) time for patients with multiple life-threatening injuries and coagulopathy who are reaching physiologic exhaustion. However, in the modern era of hemostatic resuscitation, there is a paucity of evidence to support a survival benefit with shorter OR times. The objective of this study was to determine the practice habits of trauma surgeons in the modern era of DCS and to determine if operation length affects mortality in trauma patients with abdominal injuries.

Methods: An 8-year retrospective review of consecutive adult patients with DCS for penetrating abdominal trauma at a Level I trauma center was conducted. Patient demographics, injury severity score (ISS), and penetrating abdominal trauma index (PATI) scores were obtained. Average operating room times for initial DCS were determined. Patient outcomes were analyzed with a t test for univariate analysis and a Cox proportional hazard ratio modeling was used to predict factors for survival.

Results: A total of 193 patients were identified. The majority of patients were male with penetrating trauma. Overall mortality was 14.0% (n=27/193). Average OR time was 168.7 min (range, 59-573 min). One patient had an initial DCS that was less than 60 min. Only 2.1% patients (n=4/193) had missed injuries with an average OR time of 117.5 min (range 86-157 min) for this group. In addition, 13.0% patients (n=25/193) had an early, unexpected return to the OR. On multivariate analysis, OR time was not an independent risk factor for mortality (OR 1.0, 95%CI 0.98-1.0, p=0.48).

Table 1. Patient demographics and outcomes for patients with first phase damage control surgery

	Alive (n = 166)	Dead (n = 27)	p
Demographics			
Age, median (IQR)	27 (23-36)	33 (26-40)	0.19
Male sex, n (%)	148 (89.2)	25 (92.6)	0.75
PATI, median (IQR)	25 (15-41)	29 (20.8-41.3)	0.17
ISS, median (IQR)	22 (16-33)	25 (18.5-33.5)	0.07
Initial SBP, median (IQR)	113.5 (100-136)	88.5 (66.8-111.8)	0.96
Shock Index at admit, median (IQR)	0.9 (0.7-1.2)	1.2 (0.9-1.9)	0.001
Outcomes			
Missed injury, n (%)	4 (2.4)	0	<0.0001
Early return to OR, n (%)	18 (10.8)	7 (25.9)	0.06
PRBCs in OR, median (IQR)	5.0 (0.7)	11 (6.5-23)	<0.0001
OR time (minutes), median (IQR)	157 (124.8-201.3)	167 (136-193)	0.96

Conclusion: Modern damage control practices should focus on early surgical hemorrhage control in combination with effective intra-op resuscitation efforts and not on the amount of time required to accomplish resuscitative goals. These findings suggest that in the era of modern DCS, the old tenet of 60 minutes may not be applicable to the updated era of trauma surgery and hemostatic resuscitation.

Poster # 66

STOP THE BLEED: A "GAP" ANALYSIS AND GEOGRAPHICAL EVALUATION OF INCIDENT LOCATIONS

Shannon L. Carroll BS,MD, Daniel W. Dye MD, Aidan Gilbert BS,MPH, Griffin L. Russell BS,MPH,Ph.D., Gerald McGwin Jr., BS,Ph.D., MS, Jeffrey D. Kerby* BS,MD,Ph.D., Jan O. Jansen Ph.D., MBBS University of Alabama Birmingham

Introduction: Stop the Bleed (STB) is a national campaign to encourage bystanders to become trained, equipped, and empowered to help in a bleeding emergency. STB training discusses mass casualty events while also recognizing the benefit to those injured in more usual circumstances. The aim of this study was 1) to conduct a gap analysis to determine potential benefit from STB interventions on a day-to-day basis; and 2) to conduct a geographical analysis of a major metropolitan area, to determine whether such incidents might be clustered, facilitating the prioritization of training and locating of kits.

Methods: We performed a retrospective analysis of trauma registry and medical examiners' data from a single county, 2013-2017. Incidents potentially amenable to STB were defined in terms of full (7-digit, pre- and post-dot) AIS codes. Medical examiners' data were reviewed manually to identify prehospital fatalities who might have survived if STB interventions had been applied. Incident location data and, where not available, place of residence, were geocoded by ZIP code area, and analyzed using QGIS, an open-source geographical information systems software package.

Results: We identified 159 patients who were admitted to our level I trauma center, who might have benefitted from STB. 101 had suffered blunt trauma, and 58 penetrating injuries. 137 survived to discharge, and 22 died in hospital. 12 patients with injuries potentially amenable to STB died prior to accessing the trauma system. In total, approximately 3 patients per month could benefit from STB intervention. Geographical analysis was limited by small numbers of incidents per area, but did not reveal evidence of clustering.

Conclusion: Aside from preparation for mass casualty events, STB training can potentially benefit the community for isolated incidents associated with bleeding. The number of patients who could benefit from STB, in this analysis, is relatively small. Furthermore, the locations of these incidents did not show evidence of geographical clustering, although the small number of incidents per area precluded a formal geostatistical analysis. This analysis could be used by other communities to determine if this information would inform STB activities.

Poster # 67

NARROW PULSE PRESSURE IS INDEPENDENTLY ASSOCIATED WITH MASSIVE TRANSFUSION AND EMERGENT SURGERY IN HEMODYNAMICALLY STABLE TRAUMA PATIENTS

Brittany Bankhead-Kendall MD, MS, Pedro Teixeira MD, TB Coopwood* Jr., MD, Jason Aydelotte* MD, Marc Trust MD, Sadia Ali Irene Tabas Carlos V. Brown* MD,
University Of Texas At Austin

Introduction: ATLS® considers narrow pulse pressure (NPP) a sign of Class-II hemorrhage and a precursor of hemodynamic instability. However, the true clinical implication of NPP in hemodynamically stable trauma patients remains unknown. We hypothesized that NPP is associated with massive transfusion and the need for emergent surgery in hemodynamically stable trauma patients.

Methods: All hemodynamically stable (systolic blood pressure >/=90mmHg) trauma patients admitted to our Level-1 trauma center (2010-2016) were reviewed. Patients with NPP (<40mmHg) at presentation were compared to those with normal pulse pressure (>/=40mmHg). Primary outcomes were need for massive transfusion (>/=10 units) and emergent cavitary surgery.

Results: Over 7 years, 18,978 hemodynamically stable trauma patients were admitted and 13% (2,486) had NPP. NPP patients more often required massive transfusion (5% vs. 1%, $p<0.0001$), emergent surgery (7% vs. 2%, $p<0.0001$), and the combination of both (3% vs. 0.4%, $p<0.0001$). NPP patients had higher mortality (4% vs. 2%, $p<0.0001$) and longer hospital stay (7 vs. 5 days, $p<0.0001$) and ICU stay (1.4 vs. 0.75 days, $p<0.0001$). After logistic regression controlling for age, gender, mechanism, ISS, and GCS, NPP was independently associated with massive transfusion, emergent surgery, and the combination of both.

Conclusion: In hemodynamically stable trauma patients, a narrowed pulse pressure at presentation is independently associated with a three-fold increase in the need for massive transfusion and two-fold increase in emergent surgery need.

Poster # 68

SHOULD ALBUMIN SOLUTION BE CONSIDERED AS AN ALTERNATIVE FLUID FOR PREHOSPITAL RESUSCITATION IN AUSTERE MILITARY ENVIRONMENTS?

Bijan S. Kheirabadi Ph.D., Nahir Miranda MBA, Irasema B. Terrazas MS, Amber N. Voelker MBA, Rodolfo J. De Guzman Jr., BS, Ammon W. Brown DVM and PhD, Michael A. Dubick* Ph.D., United States Army Institute for Surgical Research

Introduction:Damage control resuscitation (DCR) goals include control of hemorrhage and hemostatic resuscitation (HR); i.e. early administration of blood or blood components (1:1:1 ratio) to increase blood pressure to a permissible hypotensive level for treating hemorrhagic shock. The in-hospital DCR protocol has been extended to prehospital care for treating combat casualties. We studied the advantages of HR using blood or plasma vs albumin in surviving rabbits subjected to severe hemorrhagic shock (HS).

Methods:Laparotomy (soft tissue trauma) was performed on IV-anesthetized spontaneously breathing NZW rabbits (3.1-3.5 kg). Next, 40% of circulating blood volume was removed from a venous line to produce HS (MAP=20-25 mmHg). 15 min later, rabbits were randomly resuscitated with a small volume (12.5 ml/kg) of rabbit fresh whole blood (FWB), rabbit thawed plasma (FFP), or 5% human albumin solution (ALB) to a hypotensive target pressure (MAP) of 60 mmHg (n=9/grp) and monitored for 2hr (i.e., prehospital period). Subsequently, animals received full resuscitation using autologous blood and LR, surgically repaired, recovered and assessed over 1 week. An untreated control group (no fluid, n=6) was also included. Blood samples were collected at baseline, post-HS, post HR, day 0, 2, 4 and 8 post-operatively and analyzed for ABG, CBC, chemistry and coagulation values. Tissue samples were collected and examined histologically.

Results:Following hemorrhage lactate and base deficit levels were increased to 9.2 ±0.3 and 12.2±2.5 mM, respectively (i.e. class III/IV shock) with no difference among groups. FWB resuscitation required less volume to raise MAP to 60 mmHg ($p<0.05$ vs. albumin) and similar to FFP, but unlike albumin MAP gradually declined during the 2hr prehospital period. FWB administration also resulted in a higher % hematocrit but this advantage did not treat shock faster than other fluids. Changes in coagulation measurements (PT, aPTT, fibrinogen, and bleeding time) after surgery indicated a mild hypocoagulation that was more evident in the ALB group. Untreated rabbits all died within two hrs after hemorrhage. The resuscitated rabbits lived overnight but 2 of 9 in each group had to be euthanized on day 1 due to poor recovery associated with abnormal blood chemistry and histological evidence of multiple organ failure. All other rabbits recovered well and had normal blood tests and histology at 1 week.

Conclusion:In this model of hemorrhagic shock with 2hr of prehospital hypotensive resuscitation, no clinically significant advantage was found between early resuscitation with rabbit blood or plasma versus a human albumin solution that is readily available, stable at room temperature and compatible with all blood types. Albumin solution deserves a consideration.

Poster # 69

THE IMPACT OF PRE-HOSPITAL TOURNIQUET USE ON RESUSCITATION IN EXTREMITY ARTERIAL TRAUMA

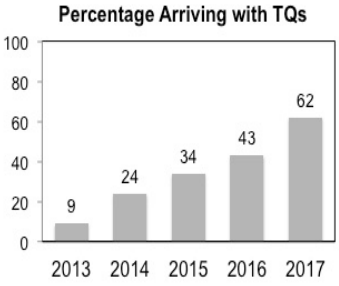
Allison G. McNickle MD, Paul J. Chestovich MD, Douglas R. Fraser MD, Deborah A. Kuhls* MD, John J. Fildes* MD, University Of Nevada-Las Vegas School Of Medicine

Introduction: This study evaluated if pre-hospital tourniquet placement altered the initial management and transfusion needs in peripheral arterial injuries.

Methods: Extremity arterial injuries were queried from our Level I Trauma Center registry from 2013-17. Groups were defined by pre-hospital tourniquet use (TQ+) or not (TQ-) and location of injury, upper (UE) versus lower extremity (LE). Variables included tourniquet duration, initial heart rate (HR), systolic blood pressure (SBP), hematocrit and severity scores. The primary outcome was transfusion within the first 24 hours, with secondary outcomes of morbidity (rhabdomyolysis, acute kidney injury, compartment syndrome), amputation (initial vs. delayed) and length of stay (LOS). Statistical tests included t-test and Chi-square for continuous and categorical variables, respectively, with $p<0.05$ significant.

Results: Injuries occurred in 192 patients with 152 (79%) males at a mean age 35.9±14.4 years. TQs were placed in 69 (36%) for 78±52 minutes. TQ use increased significantly over time. TQ+ had higher initial HR, AIS extremity score (3.2 vs. 3.0, p=0.03), MESS score (5.8 vs. 5.1, p=0.02) and more near amputations (30% vs. 17%, p=0.03). Despite similar admission hematocrit, more of the TQ+ required transfusion. TQ+ had more initial amputations; however delayed amputations, complications and LOS were not different. UE injuries occurred in 100 with 43 (43%) having TQs in place for 72±44 minutes. TQ+ had higher admission HR (112 vs. 99, $p<0.01$) and more initial amputations (12% vs. 0, $p<0.01$). Transfusions, LOS and morbidity were not different. Ninety-two had LE injuries with 26 (28%) having TQ for 88±64 minutes. TQ+ had higher MESS scores (6.8 vs. 5.6, p=0.01), more initial amputations (42% vs. 9%, $p<0.01$), higher frequency of transfusion (77% vs. 53%, p=0.04) and longer LOS. Frequency of morbidity and mortality was not different in TQ+.

Conclusion: Limbs receiving TQs had more severe injuries (higher injury scores, near amputations and increased HR), required a higher frequency (but not volume) of blood transfusion and initial amputation, without an increase in complications. The equivalent complication and mortality rates, despite higher injury severity supports the field application of TQs in severe extremity trauma.



	TQ+ (n=69)	TQ- (n=123)
HR (bpm) *	110±29	100±25
SBP (mmHg)	126±32	129±24
Hematocrit (%)	37.0±7.5	37.4±5.7
Received transfusion, n (%) *	46 (67)	59 (48)
pRBCs (units)	3.5±4.1	2.6±5.4
Initial amputation, n (%) **	16 (23)	6 (5)
Delayed amputation, n (%)	6 (9)	14 (11)
Hospital-free days (30d)	17.4±10.0	19.4±8.9
ICU-free days (30d)	25.8±5.6	26.3±5.0

*p<0.05 **p<0.01

Poster # 70

DEFINING INDICATIONS FOR MASSIVE TRANSFUSION: NOT AS SIMPLE AS LEARNING YOUR ABCS

Heidi Kipers Mullen DO, Tammy R. Kopelman* MD, Paola Pieri* MD, Karole Davis MD, Alexzandra Hollingworth MD, Melissa Pressman Singer Ph.D., Sydney Vail MD, Maricopa Medical Center

Introduction:Massive transfusion protocols (MTP) have been developed to expedite treatment of substantial hemorrhage. However predicting who will require MTP can be elusive. Recently, the Trauma Quality Improvement Program has added an Assessment of Blood Consumption Score (ABCs) ≥ 2 to the triggers to initiate MTP. We hypothesize that this addition will lead to overuse of MTP activation without significant improvement in patient identification.

Methods:A retrospective review was performed of adult trauma patients with ISS >15 presenting to our trauma center over 2 years. ABC was computed and transfusion needs were assessed for the first 24 hours. Massive transfusion (MT) was defined as needing ≥ 10 units packed red blood cells (PRBC) in the first 24 hours.

Results:380 patients met inclusion criteria of which 35 (9%) required MT. Prior triggers for MTP including transfusion in the emergency room, persistent hemodynamic instability, or active bleeding requiring intervention identified 30 patients (86%) who required MT. The addition of ABCs ≥ 2 identified one additional patient who required MT and 41 patients who did not, including 16 patients that required no PRBCs during the first 24 hours. Overall, the positive predictive value of ABCs ≥ 2 in identifying patients needing MT was only 39%. In addition, it failed to identify 9 of the 35 patients (26%) who ultimately requiring MT.

Conclusion:Use of ABCs ≥ 2 as a trigger for MTP will lead to a high over triage rate without significant improvement in patient selection over previously defined indications.

Poster # 71

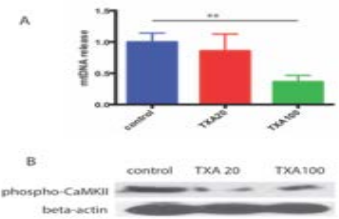
TRANEXAMIC ACID SUPPRESSES THE RELEASE OF mtDNA AND ACTIVATION OF THE CALCIUM SENSING ENZYME CaMKII IN HUMAN PLATELETS

Joseph F. Rappold* MD, Damien Carter MD, Doreen Kacer BS, Kathleen Pyburn BS, Chloe Kumpel BS, Monica Palmeri BS, MS, Robert Kramer MD, Igor Prudovsky Ph.D., Maine Medical Center

Introduction: Activated platelets are a major source of Damage Associated Molecular Patterns (DAMPs) particularly mitochondrial DNA (mtDNA). Released systemically during and after hemorrhagic shock, DAMPs are responsible for the development of the endotheliopathy of trauma and the associated release of pro-inflammatory cytokines. Tranexamic acid (TXA), a known anti-fibrinolytic used to ameliorate the effects of hemorrhagic shock, has a host of additional functions such as the release of anti-inflammatory cytokines. We hypothesized that TXA may prevent activation of platelets by inhibiting the calcium sensing enzyme CaMKII and limiting the damage caused by DAMPs release into the systemic circulation.

Methods: Platelet-rich plasma devoid of leukocytes and erythrocytes was prepared from the blood of a healthy donor by low speed centrifugation. It was incubated for 2h at 37ºC in presence or absence of TXA at 20 or 100 mg/ml. Platelets were then precipitated by high-speed centrifugation. MtDNA content in platelet-free plasma was determined by qPCR. Electrophoresis and Western blotting were applied to detect the phosphorylation of stress signaling kinases p38, MAPK and JNK, and the calcium sensing enzyme CaMKII in platelets.

Results: TXA at 100 mg/ml strongly suppressed the release of mtDNA from platelets. Both concentrations of TXA significantly decreased the phosphorylation of CaMKII (Figures A and B) but did not change the phosphorylation of p38 MAPK and JNK (data not shown).



Conclusions: The observed TXA-induced suppression of mtDNA release from platelets and the decreased phosphorylation of CaMKII, the enzyme involved in platelet activation, increases our knowledge of the method of action of TXA in hemorrhagic shock. Additional studies are necessary to fully elucidate the signaling pathways upon which TXA acts, thereby advancing understanding of the various potential uses of TXA in the critically injured and ill patient.

Poster # 72

EMPIRIC USE OF TRANEXAMIC ACID HAS NO BENEFIT IN URGENT ORTHOPEDIC TRAUMA CASES.

Bryan W. Carr MD, Wendy Li BS, Jamel G. Hill BS, Cyrus Feizpour MD, Ben L. Zarzaur* MD,MPH, Stephanie A. Savage* MD, MS Indiana University School Of Medicine

Introduction: The orthopedic literature has demonstrated a significant decrease in post-operative transfusion requirements when tranexamic acid (TXA) is given during elective joint arthroplasty. In some institutions, this practice has spread with empiric administration of TXA during semi-urgent orthopedic procedures in injured patients. Injured patients are at elevated risk of venous thromboembolic events (VTE) and no literature exists regarding the use of TXA in this manner, in this patient population. The purpose of this study was to evaluate the empiric use of TXA in semi-urgent orthopedic procedures. The hypothesis was that TXA would be associated with increased rates of VTE and have no effect on transfusion requirements.

Methods: Patients who empirically received TXA during a semi-urgent orthopedic or spine surgery following injury (TXA+) from 2014-2016 were matched using propensity score matching to historical controls (CONTROL) from 2011-2013 who did not receive TXA. Data were collected regarding injury characteristics, TXA administration, operative details and incidence of VTE. Outcome variables included incidence of VTE within 6 months of injury and packed red blood cell (PRBC) utilization. Multivariable logistic regression was used to determine odds of VTE and transfusion. A $p \leq 0.05$ was considered significant.

Table 1. Cohort characteristics

	CONTROL	TXA+	p-value
Age (years)*	51.4 (21.4)	49.8 (20.9)	0.4344
BMI†	28.7 (23.95, 34.05)	28.60 (25.3, 34.15)	0.4514
Gender (% male)	53.5%	57%	0.5463
Mech. (% blunt)	3.5%	1.5%	0.3375
ISS†	10 (9, 22)	12.5 (9, 22)	0.1590
Extremity AIS*	2.49(0.9)	2.64 (1.01)	0.1177
Total PRBC†	0 (0, 3)	2 (0, 5)	<0.0001
Total FFP†	0 (0, 0)	0 (0, 0)	0.0082
Total Platelets†	0 (0, 0)	0 (0, 0)	0.0018
Massive transfusion (%)	2%	4.5%	0.2589
Damage control surgery (%)	10%	11.62%	0.6312
Hospital LOS†	6 (3, 10)	7 (4.5, 12)	0.0006
ICU LOS†	0 (0, 3)	0 (0, 5)	0.0191
Mortality (%)	0%	1%	0.4987

* mean with standard deviation † median with interquartile ranges

Results: 200 patients were included in each group. There were no differences between groups regarding age, ISS, extremity AIS, gender or mechanism of injury. CONTROLS had a significantly shorter ICU and hospital length of stay compared to TXA+. There was no difference in mortality between groups (Table 1). There was no increase in VTE in TXA+ patients with logistic regression (OR 0.804 95% CI 0.310, 2.087). However, TXA+ patients had a significantly higher odds of being transfused during their hospital stay (OR 1.757 95% CI 1.057, 2.920) when controlling for fracture site, ISS, admission directly to the OR, need for damage control, use of a tourniquet in surgery and total number of surgeries needed. Overall transfusion was also significantly higher in the TXA+ group (CONTROL 0 units (IQR 0, 3) vs TXA+ 2 units (IQR 0, 5), $p \leq 0.0001$).

Conclusion: The empiric use of TXA in semi-urgent orthopedic and spinal surgeries did not increase the odds of VTE, the incidence of which was low. Despite the elective literature, TXA+ patients had a significantly higher odds of transfusion compared to controls and received a significantly higher volume of PRBCs compared to control. While VTE risk is static, lack of a benefit related to transfusion needs would indicate that empiric TXA use is not indicated in injured patients.

Poster # 73

ALL FIBRINOLYSIS IS NOT CREATED EQUAL – MORTALITY DIFFERENCES ACROSS THE SPECTRUM

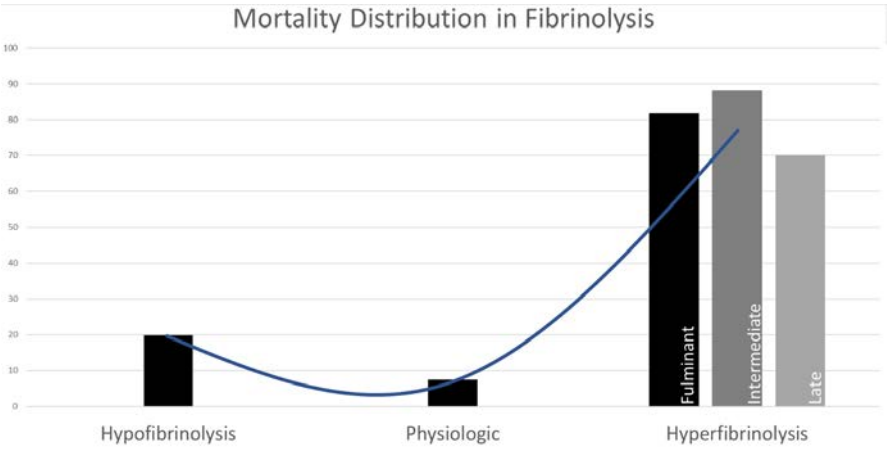
Luis R. Taveras MD, Tarik D. Madni MD, Jonathan B. Imran MD, Holly B. Cunningham MD, So-Youn Park Michael Zhou Robert Myers Alexander L. Eastman* MD,MPH, Michael W. Cripps* MD, MSCS University Of Texas Southwestern

Introduction: The discovery of increased mortality associated with hypofibrinolysis with thromboelastography (TEG) has altered our perception of the spectrum of fibrinolysis. However, this has not been identified with rotational thromboelastometry (ROTEM). Previous studies have also identified subtypes of hyperfibrinolysis. However, no single study has examined the mortality rates of the full fibrinolytic spectrum. Our aim is to describe the distribution of fibrinolysis, as measured by ROTEM; and identify associated mortality rates.

Methods: Clinical and thromboelastometry data were analyzed on trauma patients evaluated at an urban, Level 1 trauma center from May 2014 to May 2017. ROTEM analysis was performed during initial evaluation and resuscitation. Hyperfibrinolysis (HF) was defined as maximum lysis >15% in EXTEM and an enzymatic fibrinolysis index (EFI) greater 10%. Fulminant HF occurs in less than 20 min, intermediate at 21-40 min, late at 41-60 min.
Descriptive statistics were compared using Chi-square analysis and the Kruskal-Wallis test for categorical and continuous variables, respectively. Kaplan-Meier survival curves were compared using the log-rank and Wilcoxon tests.

Results: ROTEM results from 1053 patients were included in our study, 40 patients were excluded due to incomplete ROTEM assay data. Median age was 38 years (IQR 26-55), 76.5% were male and 22.1% had penetrating injuries. Median ISS was 17 (IQR 9-27). 61 patients had EXTEM ML >15%, and HF was confirmed by EFI in 58 patients.
Using a receiver operating characteristic curve with mortality as outcome the cutoff for hypofibrinolysis was defined as maximum lysis on EXTEM < 3%. Distribution of fibrinolysis was: hypofibrinolysis, 28.6%; physiologic, 65.7%; and hyperfibrinolysis, 5.7%. Mortality was significantly different between the groups: 20.0%, 7.4% and 77.6%; respectively, at 28 days post-hospitalization ($p < 0.0001$). Among the hyperfibrinolysis subtypes, a significant difference in survival was found in a Kaplan-Meier curve. Mortality for fulminant, intermediate and late HF was 81.8%, 88.2% and 70%, respectively ($p = 0.0223$).

Conclusion: Different mortality rates are found across the spectrum of the fibrinolytic pathway. Similar to the TEG results, we found that ROTEM can detect a unique entity of hypofibrinolysis that has an increased mortality and can easily be differentiated from physiologic and hyperfibrinolytic states. Furthermore, among hyperfibrinolysis subtypes, there are significant mortality differences. These results have significant implications in the treatment of severely injured patients and suggest potential different biologic mechanisms exist within the fibrinolytic pathways.



Poster # 74

EARLY CHEMOPROPHYLAXIS FOLLOWING TRAUMATIC BRAIN INJURY DOES NOT INCREASE MORBIDITY

Lisbi Rivas MD, Michael Vella MD, Tammy Ju MD, Sara Perez BS, Ramamahesh C. Seeni BS, Joseph S. Fernandez-Moure MD, MS, Andrew Sparks MS, Stephen Gondek MD,MPH, Mark J. Seamon* MD, Babak Sarani* MD, George Washington University

Introduction:There is no standard of care regarding timing to initiation of pharmacologic prophylaxis for venous thromboembolism (VTE) in traumatic brain injury (TBI) patients. The aim of this study is to evaluate the safety of an early strategy for start of VTE chemoprophylaxis in a select cohort of TBI patients. We hypothesize that early administration is safe.

Methods:A retrospective study was performed at two Level 1 Trauma Centers. Inclusion criteria included: age 18 years or older, blunt mechanism of injury, and head Abbreviated Injury Score (AIS) > 1. Exclusion criteria included craniectomy prior to 24 hours, progression of bleed on 6 hour follow-up CT scan, and patients that did not have a follow-up head CT. Patients were divided in early (≤ 24 hours) and late (> 24 hours) cohorts based on time to initiation of chemoprophylaxis. Progression of bleed was the primary outcome. Secondary outcomes included need for craniectomy, incidence of VTE, and mortality. Multivariate regression testing was performed to control for age, head AIS, and ISS.

Results:289 patients were enrolled (table 1). Chemoprophylaxis used was 30 % vs 70% heparin vs low molecular weight heparin, respectively. Progression of bleed after VTE chemoprophylaxis administration was 4.5 % in the early group vs 7 % in the late group (p= 0.5). Craniectomy rate after 24 hours was 2.8% vs 15.9% (Odds Ratio 0.2, Confidence Interval 0.04-0.5, p < 0.01) in the early vs late group, respectively. There were no VTE events in the early group vs 2.8% in the late group (p=0.08). There was no difference in mortality.

Conclusion:Early initiation of VTE chemoprophylaxis is safe in TBI patients with a stable head CT 6 hours following injury. Delay in start of chemoprophylaxis may be associated with an increased VTE risk.

Table 1: Demographics

	<24 (n=107)	>=24 (n=182)	p-value
Age	55.20 ± 21.71	58.79 ± 21.56	0.1739
ISS	15.43 ± 7.47	18.41 ± 8.57	0.0030
Head AIS	3.36 ± 0.87	3.57 ± 0.94	0.0527

Poster # 75

EVOLVING PRACTICE PATTERNS IN THE USE OF PHARMACOLOGIC VENOUS THROMBOEMBOLISM PROPHYLAXIS AFTER BLUNT SOLID ORGAN INJURY

Paige Newell BA, Deacon Lile MD, Michael Mazzei MD, Zoe Maher MD, Jessica Beard MD,MPH, Joseph Lopez Jr., MD, Leonard Mason MD, Abhijit Pathak* MD, Thomas Santora* MBA,MD, Lars Sjoholm* MD, Amy Goldberg* MD, Elizabeth Dauer MD,
Temple University Hospital

Introduction: The use of pharmacologic venous thromboembolism (VTE) prophylaxis in patients undergoing non-operative management for blunt solid organ injury (BSOI) must balance the risk of bleeding with that of VTE. Prior studies have examined the safety of VTE prophylaxis at 48 and 72 hours, but limited evidence exists regarding earlier administration. Despite its role in prevention of VTE, guidelines for the administration of VTE prophylaxis in BSOI remain unclear. We sought to answer if standardized practice management guidelines (PMG) existed, if these PMG recommendations differ from what is practiced clinically and if there is a trend toward earlier VTE prophylaxis without an increase in failure of non-operative management.

Methods: A nationwide sampling of PMG for VTE prophylaxis after BSOI were compiled and the recommended timing of prophylaxis was compared with clinical data reported through the Trauma Quality Improvement Program (TQIP) database from 2013-2016. Adult patients with blunt injury to the spleen, liver or kidney undergoing initial non-operative management without concomitant TBI or pre-hospital anticoagulation were included. Timing of VTE prophylaxis and need for intervention related to the BSOI were the outcomes of interest. Data was analyzed using chi-squared, ANOVA single factor analysis, and two sample t-tests.

Results: Institutional guidelines were solicited from 31 level I trauma centers nationwide. 26 institutions responded of which 12 (46%) had no formal PMG. The remainder had a wide range of practices from immediate initiation to initiation after 48 hours with evidence of stable hemoglobin. 22,549 patients met inclusion criteria in the TQIP database. There was a statistically significant increase in the percentage of patients receiving VTE prophylaxis before 24 hours from 23% in 2013 to 26% in 2016 ($p=0.003$). There was a significant decrease in the mean time to VTE prophylaxis initiation from 66 hours in 2013 to 53 hours in 2016 ($p < 0.001$). Earlier administration (< 24 hours) did not increase the rate of failure of non-operative management ($p< 0.001$).

Conclusion: Since 2013, there has been a significant trend toward earlier administration of VTE prophylaxis in patients undergoing non-operative management for BSOI, though institutional guidelines vary widely. With an increasing percentage of patients receiving VTE prophylaxis at < 24 hours, there is a need for a multi-institutional trial directly examining optimal timing for VTE prophylaxis in this population.

Poster # 76

TRAUMA INDUCED PLATELET DYSFUNCTION IS NOT CORRECTED BY TRANSFUSION

Lily Tung MD, Varun Danda BS, Antonio Davila Ph.D., Scott Diamond Ph.D., Carrie Sims* MD,Ph.D., University of Pennsylvania

Introduction: Although trauma induced coagulopathy is a common problem following severe injury, the contribution of platelet dysfunction (PD) remains unclear. We hypothesize that while PD frequently occurs following trauma and persists despite platelet transfusion, it does not impact outcome.

Methods:Trauma patients ≥18 years old were evaluated between March and December 2017. Only patients with injuries requiring ICU admission were included. Blood samples were collected on arrival (T0), at 3h (T3), 6h (T6), 12h (T12), and 24h (T24) and assayed by thromboelastography and platelet mapping (Haemonetics TEG6s). Patient demographics, anti-platelet therapy, mechanism of injury (MOI), ISS platelet count, blood products transfused, length of stay, and mortality were recorded. Mann-Whitney, Chi-square, and Spearman's tests were used where appropriate, ($P<0.05$, significant).

Results:Forty-eight patients were enrolled with demographics as described in the table. 53.5% of patients had low MA at T0, which peaked at T3 (81.1%). During the first 24hours, when maximally stimulated with thrombin (HKH MA), only 18 pts demonstrated platelet inhibition whereas 38 demonstrated ADP pathway inhibition (ADP MA). ISS and ADP MA were negatively correlated at T3 (r_S=-0.353, p=0.041). This was more pronounced following blunt trauma (r_S=-0.571, p=0.04). Those with low ADP MA at T3 received significantly more platelet, blood, and FFP transfusions between T0 and T3 than normal ADP MA patients (0.5 vs 0, p=0.021, 4 vs 0, p=0.002, 3 vs 0, p=0.004, respectively). Platelet transfusion, however, did not significantly improve platelet function in those with low MA. PD did not impact LOS or mortality.

Conclusion:PD is common in trauma patients and appears to impact both maximal thrombin stimulation and ADP pathway activation. Although more blood products are required in trauma patients with PD, current platelet resuscitation strategies are either insufficient or the platelets being transfused are ineffective.

	All patients (n=48)	Normal MA (n=5)	Low MA (n=39)	*P*-value
Male, %	89.6	80	89.7	0.47
Age, median (IQR)	33.5 (23.3-45)	66 (47-77)	28 (21-52)	0.011
Race				
Caucasian	31.3	80	25.6	0.029
African American	68.6	20	74.4	
ISS, median (IQR)	16 (10-29)	14 (7-22)	17 (13-33)	0.171
Blunt mechanism, %	43.8	29.4	70.6	0.008
ADP receptor inhibitor, %	0	0	0	
ICU LOS, median (IQR)	4 (2-8)	2 (2-19)	4 (2-9)	1
HLOS, median (IQR)	7 (4.3-19.3)	5 (4-19)	8 (4-21)	0.504
Mortality at 24hr, %	4.2	0	5.1	1
Mortality at 30d, %	16.7	20	17.9	1

MA=maximum amplitude; IQR=interquartile range; ISS=injury severity score; ADP=adenosine diphosphate; ICU=intensive care unit; LOS= length of stay; HLOS=hospital length of stay

Poster # 77

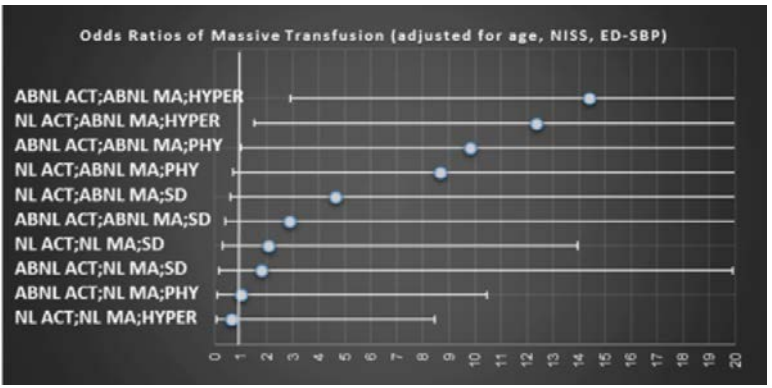
Epidemiology of Trauma-Induced Coagulopathy (TIC): Thrombelastography Phenotypes

Geoffrey R. Nunns MD, Gregory R. Stettler MD, Ernest E. Moore* MD, Hunter B. Moore MD, Anirban Banerjee MD, Christopher C. Silliman MD,Ph.D., Angela Sauaia* MD,Ph.D., University of Colorado Denver

Introduction: Thrombelastography (TEG)-guided resuscitation has been shown to reduce TIC-related deaths. TEG comprehensively assesses the coagulation process through different indices: Activated clotting time (ACT): clot formation; 2) Maximum amplitude (MA): clot strength; 3) LY30: fibrinolysis. Although fibrinolysis' impact has been extensively studied, the significance of combinations of TEG indices remains elusive. We studied the impact of phenotypes defined by TEG indices combinations.

Methods: Trauma activation patients admitted to a Level 1 Trauma Center 2014-2017 were prospectively enrolled and a rapid TEG obtained within 1hr post-injury. Abnormal (ABNL) TEG values were: ACT≥128 sec; MA<55mm; Lysis was categorized as Hyperfibrinolysis (HYPER: LY30>=3%), Physiologic (PHY: LY30 0.9-2.9%); Shutdown (SD: LY30<0.9%). Multinomial logistic regression (LR) identified predictors of phenotypes and binomial LR the impact of phenotypes.

Results: 409 patients were included; median age 32 years; median New Injury Severity Score (NISS) 22; 55% suffered blunt injuries. Overall, 7% required massive transfusion (MT: >10 RBC units or death/6 hours), and 14% died. The most common TIC phenotype was Normal (NL) ACT/NL MA/PHY, and the most lethal was ABNL ACT/ABNL MA/SD. MT was associated with ABNL ACT/ABNL MA/HYPER. Among the tested specific injuries, pelvic fractures were predictive of NL ACT/ABNL MA/PHY (Adjusted OR= 12.4; 95%CI: 2.3-66.7) and of ABNL ACT/ABNL MA/HYPER (Adjusted OR=6.1; 95%CI: 1.9-19.4). No other specific injury tested was predictive of TIC phenotypes. When indicators of injury severity/shock were added, NISS, age, ED-SBP were the only significant predictors of TIC phenotypes (all p<0.009). The adjusted OR of MT for the distinct TIC phenotypes are shown in the figure below. The phenotype independently associated with death was ABNL ACT/ABNL MA/HYPER (Adj OR=5.7; 95%CI: 1.4-23.3).



Conclusion: The combinations of TEG indices are associated with specific risk factors and outcomes. These phenotypes can be used to further assist in hemostatic resuscitation.

Poster # 78

THE DYNAMICS OF ANTITHROMBIN III AND ITS ROLE IN POST-TRAUMATIC VENOUS THROMBOEMBOLISM

Brandon J. Behrens MD, Elizabeth Dewey Mackenzie Cook* MD, David Martin John Yonge Samantha Underwood MS, Diane Lape Andrew Goodman Keeley McConnell Lelani Lealiiee Ariane Audett Jevgenia Zilberman-Rudenko Martin Schreiber* MD, Oregon Health & Science University

Introduction: Trauma patients exhibit a complex balance of coagulopathy and thrombosis that, if left untreated, leads to deep vein thrombosis (DVT) rates as high as 60%. The American College of Chest Physicians (ACCP), therefore, recommends chemoprophylaxis with heparin or low-molecular weight heparin (LMWH). Despite prophylaxis, rates of DVT remain unacceptably high. Our lab has shown that up to 67% of trauma patients are found to be antithrombin III (ATIII) deficient. Previous studies have suggested that trauma patients have depressed levels of ATIII and this deficiency predisposes them to increased rates of DVT. We hypothesize that ATIII deficiency is associated with increased rates of DVT and pulmonary embolism (PE).

Methods: This was a prospective, observational, single institution study performed at a Level I trauma center. Data were collected on 293 trauma patients at the following time points: baseline, 8 hours, 16 hours, 24 hours, 48 hours, and days 3, 4, 5, 6 following the initial sample collection. Antithrombin III levels were measured via chromogenic functional assay and reported as a percentage with a reference range of 80-120%. Chemoprophylaxis strategy, DVT, and PE screening were conducted per institutional protocol and were not influenced by this study. Subjects were followed to discharge to assess for DVT/PE.

Results: In our cohort, 12.8% (38/287) of subjects were antithrombin III deficient at baseline and a total of 44.1% (131/293) of subjects were deficient at any time point across the first six days of admission. Antithrombin III deficiency was associated with increased length of stay 10.2 d vs 6.2 d ($p < 0.01$), increased ICU length of stay 4.3 d vs 2.2 d ($p < 0.01$), increased number of ventilator days 2.2 d vs 0.4 d ($p = 0.01$), increased ISS 19 vs 15 ($p < 0.01$), and increased mortality 9.2% vs 1.2% ($p < 0.01$). After multivariate analysis, antithrombin III deficiency was not found to be associated with a significantly increased rate of DVT 10.7% vs 5.6% ($p = 0.1$) or pulmonary embolism 1.5% vs 0% ($p = 0.2$). Average antithrombin III levels were only significantly different between VTE and no-VTE groups at hour 8 and remained above 80% at all but one time point for both groups.

Conclusion: ATIII deficiency is associated with increased severity of illness and worse hospital outcomes. The current study failed to detect a difference in thromboembolic complications in patients with ATIII deficiency but this could be related to inadequate power.

Poster # 79

EARLY INITIATION OF PHARMACOLOGICAL VENOUS THROMBOEMBOLISM PROPHYLAXIS IN PATIENTS WITH HIGH-GRADE BLUNT LIVER AND SPLENIC INJURIES IS NOT ASSOCIATED WITH AN INCREASED RISK OF BLEEDING

Kerry K. Moore PharmD, Cassie A. Barton PharmD, BCPS, BCCCP, Yuxuan Wang MD, Elizabeth Dewey MS, Albert Chi* MD, Martin Schreiber* MD, Susan Rowell* MD, MCR Oregon Health & Science University

Introduction: Nonoperative management (NOM) is the standard of care for hemodynamically stable patients with traumatic blunt solid organ injuries. Management of these patients is challenging as the risk of venous thromboembolism (VTE) and bleeding (failure of NOM) must be balanced. Current guidelines for the management of these injuries do not define the time at which pharmacological VTE prophylaxis (VTEp) can be initiated safely but suggest that VTEp should be considered within 48 hours if no contraindications exist. We aimed to compare the safety of early versus delayed initiation of VTEp in patients with high-grade (AAST grades ≥ 3) blunt liver and spleen injuries undergoing initial NOM.

Methods: All patients 16 years and older admitted to a level 1 trauma center with high-grade (AAST grades 3, 4, and 5) blunt liver and spleen injuries between January 2008 and October 2017 were included. Patients with an indication for therapeutic anticoagulation, requiring massive transfusion upon presentation, or undergoing operative intervention for their abdominal organ injuries within the first 24 hours were excluded. Patients were divided into three groups based on the timing of the first-dose of VTEp: early (≤ 48 hours), intermediate (49-71 hours), and late (≥ 72 hours) after presentation. Bleeding was defined as the need for one or more units of blood product and/or surgical or interventional radiology (IR) intervention for their solid organ injury after initial resuscitation. The primary endpoint was the incidence of bleeding after initiation of VTEp. The rate of VTE during the index admission was also evaluated.

Results: The study population included 232 patients. There were 75 grade 3 injuries (25 liver, 52 spleen), 145 grade 4 injuries (63 liver, 82 spleen), and 15 grade 5 injuries (7 liver, 8 spleen). Twenty-seven patients (11.6%) received early VTEp, 42 patients (18.1%) intermediate, 51 patients (22.0%) late, and 112 patients (48.3%) never received VTEp. Baseline demographic, physiologic, and laboratory variables were similar across groups, with the exception of a lower ISS and higher GCS score in the early VTEp group. The overall rate of IR intervention within the first 24 hours was 18.9% and was not different across groups ($p = 0.32$). Early VTEp was not associated with an increased risk of bleeding when compared to those receiving intermediate and late VTEp (7.4% early vs. 11.9% intermediate vs. 5.8% late, $p = 0.84$). The incidence of bleeding in patients who never received VTEp was 8.9%. VTE developed in 10% of those who received VTEp ($n = 12$) as compared to 1.8% ($n = 2$) of those who never received VTEp.

Conclusion: In this retrospective study of patients with high-grade blunt abdominal solid organ injuries, early initiation of VTEp within 48 hours of admission did not lead to an increase in delayed bleeding. Prospective studies should be conducted to further define the optimal timing of VTEp in this patient population.

Poster # 80

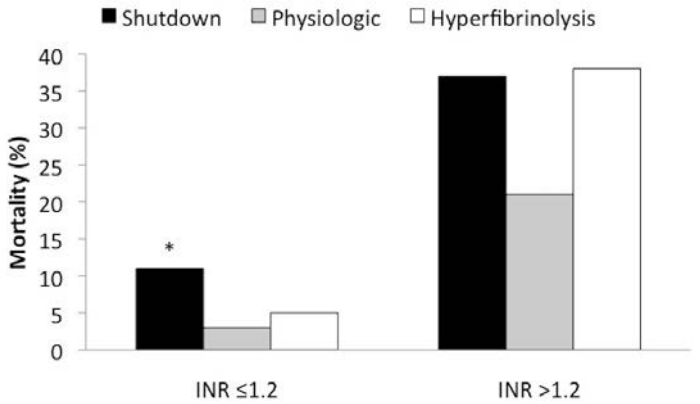
IDENTIFYING FIBRINOLYSIS SUBPHENOTYPES THAT GUIDE ANTIFIBRINOLYTIC THERAPY

Joshua J. Sumislawski MD, Hunter B. Moore MD, PhD, Ernest E. Moore* MD, Angela Sauaia MD, PhD, Lucy Z. Kornblith MD, Amanda S. Conroy Rachael A. Callcut* MD, MSPH, Mitchell J. Cohen* MD, Denver Health Medical Center

Introduction: Dysregulated fibrinolysis after injury is associated with increased mortality. The debate over antifibrinolytic therapy is complicated by the lack of a physiologic parameter or laboratory test, including thromboelastography (TEG), to direct treatment. Recent work has described fibrinolysis subphenotypes based on tissue plasminogen activator (tPA) sensitivity; however, no conventional assay exists. Since tPA is released from ischemic endothelium and international normalized ratio (INR) reflects coagulation initiated by tissue damage, we hypothesized that INR combined with TEG would identify patients in hyperfibrinolysis (HYP) or fibrinolysis shutdown (SD) with highest mortality, guiding therapy.

Methods: Blood samples were collected prospectively from critically injured patients upon arrival at an urban Level I trauma center. TEG and INR were used to classify patients by fibrinolysis subphenotype. Outcomes were compared.

Results: During a six-year period, 657 patients (median ISS 10, mortality 11%) were enrolled. Overall mortality was 15% for SD, 5% for physiologic fibrinolysis, and 19% for HYP (p=0.001). In the normal-INR cohort, SD had highest mortality (11%, 3% physiologic, 5% HYP; p=0.003; figure), fewer ventilator-free days (p=0.001), and longer ICU and hospital stays (p=0.001) as well as increased ISS (p=0.001) and severe head injury (37%, 15% physiologic, 16% HYP; p<0.001). In the elevated-INR cohort, HYP trended toward highest mortality. After controlling for injury severity, SD and elevated INR remained significant predictors of mortality.



Conclusion: Fibrinolysis subphenotypes can guide antifibrinolytic therapy. In patients with normal INR, SD is associated with traumatic brain injury and increased mortality compared with other fibrinolysis phenotypes. Empiric use of antifibrinolytic therapy would likely not benefit these patients and should be avoided.

Poster # 81

Complications in Low-Risk Elderly Trauma Patients: A Case-Control Study

Robert A. Tessler MD, Melissa M. Rangel BS, Micaela L. Rosser BS, Frederick P. Rivara MD,MPH, Eileen M. Bulger* MD, FACS, Monica S. Vavilala MD, Saman Arbabi* MD,MPH, Harborview Injury Prevention And Research Center

Introduction:The proportion of trauma patients 65 years and older is rising. Major inpatient complications tracked in the Trauma Quality Improvement Program (TQIP) in this population include unplanned return to the intensive care unit (ICU), unplanned intubation, pneumonia, and unplanned return to the operating room (OR). Data on risk factors for these common complications among elderly trauma patients thought to be low-risk are limited. We sought to determine the association between comorbidities, home medications, inpatient opioids, and inpatient benzodiazepines with risk of common inpatient complications in low-risk elderly trauma patients.

Methods: Cases were trauma patients 65 years or older admitted to a Level I trauma center from January 2015 to August 2016 with a TQIP predicted probability of complication <20% and who experienced an unplanned return to the ICU, unplanned intubation, pneumonia, or unplanned return to the OR. Two age-matched controls for each case were randomly selected from within the same time period and same TQIP predicted probability of complication. We generated estimated odds-ratios for any complication using multivariable conditional logistic regression.

Results:We identified 94 (9.6%) unique cases from 983 trauma patients 65 years and older with a TQIP predicted probability of complication <20%. Some cases had >1 complication: 51 unplanned returns to the ICU, 27 pneumonias, 18 unplanned intubations, and 12 unplanned returns to the OR. There were 188 randomly selected age-matched controls from the remaining 889 patients that did not experience a complication. Median age for cases and controls was 78 (IQR=70, 85), 56.4% were male, and 74.5% were falls. Half of patients had traumatic brain injury (TBI), and 31.6% had a chest injury with no difference in proportions between cases and controls. Cases were more often intubated (34.0% vs 22.3%, Chi-squared p=0.04) and had higher median Injury Severity Score (ISS) (cases = 17 (IQR 10, 25), controls = 14 (IQR 10, 19)). After adjustment for age, sex, intubation, undergoing an operation, TBI, ISS, and chest injury, the risk of complication was higher for those on home beta blocker and home anticoagulants (aspirin, Plavix , Coumadin, direct thrombin, and Xa inhibitors) compared to patients not on these medications (beta blocker OR= 2.3, 95%CI 1.2,4.3 and anticoagulants OR=2.2, 95%CI 1.2, 4.1). Patients with a history of diabetes and dementia also had higher odds of complication (OR=2.0, 95%CI 1.1, 3.7, and OR=2.0, 95%CI 1.0, 4.3, respectively). The odds of complication were 10% higher for each additional 10 morphine-equivalents-per-hospital-day, although the confidence interval included 1 (OR=1.1, 95%CI 1.0, 1.2, p=0.2). There was no association between lorazepam-equivalents-per-hospital-day and risk of complication in adjusted models.

Conclusion: Low-risk elderly trauma patients on home beta blockers and anticoagulants may be at elevated risk for unplanned return to ICU, unplanned intubation, pneumonia, or unplanned return to the operating room. History of diabetes and dementia are also associated with greater risk. There may be an association between additional opioid administration and risk for complications. Pre-existing co-morbidities appear to have the strongest association with complications in low-risk elderly trauma patients.

Poster # 82

THE FINANCIAL IMPACT OF GERIATRIC TRAUMA ON THE TRAUMA SYSTEM: ANALYSIS OF MEDICARE DATA

Samir M. Fakhry* MD, R. Lawrence Reed* II, MD, Jennifer Ward MBA,RN, BSN
TRAUMA CENTER ASSOCIATION OF AMERICA

Introduction: Trauma is a significant and increasing contributor to the burden of disease in the Medicare population. We analyzed Medicare data to determine geriatric trauma volumes and expenditures and their impact on the trauma system

Methods: Using the 100% Medicare Standard Analytic File for inpatients and outpatients for 2012-2015, we selected claims with trauma diagnoses and extracted patient demographics, admission type, payments, utilization rates for 068x revenue codes, high cost outliers and treating hospital descriptors.

Results: 253,948 patients and 259,995 claims were identified with an average inpatient payment of $18,619 and an outpatient payment of $2,082. The total annual Medicare expenditure for trauma was $982,022,622 in 2012, $1,030,003,625 in 2013, $1,081,868,535 in 2014 and $1,151,419,712 (annualized) in 2015, representing a 17% increase over 4 years. 3812 hospitals had at least 25 trauma inpatients: 174 level 1, 277 level 2, 397 level 3, 490 Level 4, 6 Level 5 and 2,468 non-trauma center. 77.9% of patients were treated at a teaching hospital. According to the CMS CPT cost statistics file, payment for outpatient claims for trauma activation (HCPCS G0390) were as follows: 2012: 2,653, 2013: 3,009, 2014: 3,131, 2015: 4,257. This suggests that either most geriatric trauma activations become inpatients (their activation fee rolls into the inpatient DRG) or centers are not charging activation fees.

Conclusion: Medicare expenditures for trauma increased 17% over the 4 years of this study and represent approx. 0.65% of Medicare expenditures. 77.9% of geriatric trauma inpatients were treated at teaching hospitals. A relatively small number of payments were made for trauma activation. These data show that costs for geriatric trauma are increasing and suggest that there may be opportunities for better triage of injured geriatric patients in the trauma system.

Poster # 83

AGE SHOCK INDEX: A VALID PREDICTOR OF MORTALITY IN GERIATRIC TRAUMA PATIENTS

Ansab Haider MD, Jorge Con MD, Kartik Prabhakaran MD, Seungwhan Pee MD, Matthew Bronstein MD, David Samson MS, Leandra Krowsoski MD, Patrice Anderson MD, Gary Lombardo MD, Anthony Policastro MD, Rifat Latifi* MD, Westchester Medical Center

Introduction: Shock index (SI=Heart rate/Systolic Blood Pressure) and age are both well known predictors of mortality in trauma patients. However, it is often postulated that due to the dampened physiologic responses in elderly trauma patients, traditional vital signs including SI may have higher false negative rate for predicting mortality. The aim of our study was to evaluate if age shock index (ASI= age x SI) may be a better predictor of early mortality in geriatric trauma patients.

Methods: We abstracted two years of NTDB for all patients ≥65 years of age and Injury Severity Score (ISS) >15 with complete data. Transferred patients and patients dead on arrival were excluded. Patient demographics, injury parameters, and traditional vital signs were recorded and SI, and ASI were calculated. Our outcome measure was early mortality (≤24 hours). Area under receiver operating curve (AUROC) was calculated for each vital signs and index and compared.

Results: A total of 18,736 patients were included. Mean age was 74±6 years, 58.7% were male, median ISS [IQR] was 21 [17 - 26], and the overall early mortality rate was 4.1%. HR, SBP, SI, and ASI were all significant predictors of early mortality ($p<0.001$). AUROC [95% CI] for SBP and HR was 0.43 [0.42-0.45] and 0.58 [0.56-0.60] respectively. SI had an AUROC of 0.61 [0.59-0.63]. Highest AUROC was noted for ASI 0.62 [0.60-0.64]. Even in the subgroup of patients with normal traditional vital signs, patients with ASI>50 had 30% higher odds of early mortality (OR [95% CI] : 1.3 [1.1-1.6]). SI was unable to predict mortality in this subgroup of patients.

Conclusion: Traditional vital signs significantly underperforms in predicting early mortality in geriatric trauma patients. ASI has the highest predictive power followed by SI. ASI may be a better tool for effective triage of seriously injured geriatric trauma patients.

Poster # 84

SATISFACTION OF OLDER ADULT TRAUMA PATIENTS AND THEIR CAREGIVERS BEFORE IMPLEMENTATION OF THE PALLIATIVE CARE TQIP GUIDELINES ACROSS THREE TRAUMA CENTERS: CAN WE DO BETTER?

Rebecca Vogel MD, Constance McGraw MPH, Alessandro Orlando MPH, Pamela Bourg Ph.D.,RN, Allen Tanner II, MD, Laura Peck DO, David Bar-Or MD, St. Anthony Hospital

Introduction: Palliative care has been suggested to improve patient and family communication, satisfaction with care, and decrease time to identification of poor prognosis and hospital length of stay. Studies examining patient satisfaction and palliative care in trauma patients are limited. The purpose of this study was to compare satisfaction and in-hospital outcomes of older adult trauma patients and their primary caregivers with our current palliative care services.

Methods: This prospective cohort study enrolled trauma patients aged ≥55 and their primary caregiver, from 11/2016-10/2017, across three ACS-verified trauma centers (three Level I). Patients were subject to usual care, including ad hoc palliative care interventions. Consented patients and caregivers were administered satisfaction surveys prior to decision to discharge; patients took the Family Satisfaction with Advanced Cancer Care Scale (FAMCARE-P13, 65 possible points), while caregivers took the FAMCARE survey (100 possible points); higher scores indicate higher satisfaction. Both surveys were divided into four structures: Information Giving, Availability of Care, Physical Care, and Psychosocial Care. Study outcomes were overall mean (SD) satisfaction, satisfaction <85% versus ≥85%, and satisfaction by survey structure. Univariate differences between satisfaction groups (<85% vs. ≥85%) and conceptual structures were assessed using chi-squared tests and Student's t-tests, respectively.

Results: There were 273 patients and 295 primary caregivers included in this study. The overall mean (SD) satisfaction was 85.2% (11.0%) for patients and 86.6% (11.0%) for caregivers. 53% of patients and caregivers had overall satisfaction scores ≥85%. Compared to patients with satisfaction <85%, a greater proportion of patients with satisfaction ≥85% were discharged home versus an outside facility (51% vs. 39%, P=0.04), and a smaller proportion had a mental illness (5% vs. 13%, P=0.04). The structure with the highest (mean, SD) patient satisfaction was Psychosocial Care (87.8%, 14.0%), and Availability of Care (88.6%, 13.5%) for caregivers. Information Giving was the structure with the lowest (mean, SD) satisfaction for patients (84.2%, 13.5%) and caregivers (84.2%, 13.5%). Caregivers were significantly more satisfied with Availability of Care (88.6% vs. 86.2%, P=0.001) and Physical Care (86.7% vs. 85.5%, P=0.008) than patients.

Conclusion: These data suggest that on average, patients and caregivers were more than "satisfied" with overall care, and highly valued coordination of care and inclusion of family in care decisions. Similar to other studies, there is room for improvement in communication of information sharing among clinicians, patients and families, which may also account for the lower patient satisfaction scores in Availability of Care. Moving forward, these baseline data will help us best determine the impact of the new TQIP guidelines on patient and caregiver satisfaction with trauma care.

Poster # 85

OLD AGE WITH A SUSPICIOUS MECHANISM OF INJURY SHOULD BE A TRAUMA TEAM ACTIVATION CRITERION

James M. Bardes MD, Elizabeth Benjamin* MD,Ph.D., Morgan Schellenberg MD, Kenji Inaba* MD, Demetrios Demetriades* MD,Ph.D., LAC+USC Medical Center

Introduction: Trauma Team Activation (TTA) criteria have been described by the Committee on Trauma (COT). Although age is not included in the standard criteria, many believe that the vital signs in elderly patients are often unreliable, and many severely injured patients may have normal vital signs initially, only to deteriorate rapidly a short time later. This undertriage may affect outcomes. In addition, elderly patients are an at risk population even after fairly moderate trauma. Based on outcome data, our institution has included age≥70 in patients with certain mechanisms of injury, as a TTA criterion. The purpose of this study was to determine if this TTA criterion appropriately identifies patients in need of additional resources without significantly impacting overtriage rates.

Methods: Retrospective study of all TTAs from Jan 2012-Dec 2016. Demographics, injury and admission data, ISS, ER intubation, direct ICU or OR admission from ER, and interventions were collected. Primary outcome was mortality, secondary outcomes, ICU and hospital LOS. Patients were stratified into those meeting standard criteria (TTA-S), and those that were activated based on age alone (TTA-A). TTA patients with ISS>15, ED intubation, ICU admission, direct transfer to OR, immediate catheter based intervention, hospital length of stay (HLOS) >48 hours, and mortalities were considered appropriately triaged.

Results: During the study period there were 5436 total TTAs. Of the 739 TTAs in patients age≥70, there were 198 (26.8%) who met the standard criteria for TTA, and 541 (73.2%) were had TTA based on only age≥70. In the TTA-A group, despite activation solely based on age, 49 (9%) died. More than a quarter of the TTA-A patients had ISS>15 (n=149; 27.5%), 65 (12%) underwent immediate OR or catheter-based intervention, 72 (13%) required ED intubation, and 306 (56.6%) required direct admission to the ICU. Only 50% of TTA-A patients were discharged home. After exclusion of the pre-designated criteria above, overtriage rate of the TTA-A subgroup was 33.5%, well within the recommended range.

Conclusions: Elderly patients with severe trauma patients often do not meet the standard TTA criteria, which might result in potentially dangerous undertriage. Addition of the age (≥70 years) criterion for trauma team activation, reduces undertriage and at the same time does not result in unacceptable overtriage.

	TTA-S N=198	**TTA-A N=541**	
Mortality	120 (60.6%)	49 (9.1%)	p<0.0001
ICU admission	151 (76.3%)	306 (56.6%)	p<0.0001
ER intubation	146 (73.7%)	72 (13.3%)	p<0.0001
Immediate OR	58 (29.3%)	40 (7.4%)	p<0.0001
Catheter Intervention	9 (4.5%)	25 (4.6%)	p=1
HLOS>48 hours	110 (55.6%)	295 (54.5%)	p=0.86
ISS>15	130 (65.7%)	149 (27.5%)	p<0.0001

Poster # 86

Are We More Willing to Make Dad Comfortable after Trauma?

Stephanie N. Lueckel MD, ScM, Samuel Miller MD, Elizabeth Tindal MD, Tareq Kheirbek MD, Sean F. Monaghan MD, Andrew H. Stephen MD, Eric Benoit MD, Michael D. Connolly MD, Charles A. Adams* Jr., MD, William G. Cioffi* MD, Brown University Rhode Island Hospital

Introduction: The American College of Surgeons (ACS) Trauma Quality Improvement Program's Palliative Care Best Practice Guidelines highlights the need to focus on patient comfort at the end of life. Within our analysis, we hypothesize male sex plays a significant role to continue medical interventions rather than transition to Comfort Measures Only (CMO) status with further analysis looking at specific factors that might be associated with transition to CMO.

Methods: This is a 2 year retrospective review of adult (age > 18years) patients from a level 1 trauma center. Data extracted included age, sex, injury severity score (ISS), mechanism of injury (MOI), and medical comorbidities. Patients were considered to be CMO if support was withdrawn in hospital or if patients were discharged to hospice. Logistic regression analysis was performed to identify significant predictors of CMO status. Case-control matching was then performed matching for age, ISS, and MOI. Repeat regression analysis was performed.

Results: 6803 patients were identified; 367 in the CMO group. CMO patients were older ($p<.001$), had higher ISS ($p<.001$) and were more likely to be white ($p<.001$). CMO patients were more likely to have hypertension ($p<.001$), diabetes (DM) ($p<.001$), congestive heart failure (CHF) ($p<.001$), chronic obstructive pulmonary disease (COPD) ($p<.05$), and functionally dependent health status (FDHS) ($p<.001$) CMO patients were less likely to abuse alcohol, tobacco or other drugs ($p<.001$). Regression analysis revealed independent predictors of CMO status: older age ($p<.05$), male sex ($p<.001$), non-white race ($p<.05$), higher ISS ($p<.001$), DM ($p<.05$), CHF ($p<.001$), FDHS ($p<.001$). Case-control matching yielded a cohort of 706 patients, 353 were CMO. CMO patients were still more likely to be men ($p<.05$) and to be white ($p<.05$), but there were no differences in age or ISS. Repeat regression analysis in this cohort revealed male sex ($p<.05$) and non-white race ($p<.05$) as significant predictors of CMO status.

Conclusion: Previous studies found that non-white race was associated with a shift towards life-sustaining care but sex has never been determined to have an impact on CMO. Our findings highlight that sex may in fact play a role in CMO decisions. Additional analysis should be done with regards to cultural and religious beliefs as well as bias within physicians guiding decisions to transition patients to CMO.

Poster # 87

HOSPITAL-LEVEL TENDENCY TO ADMIT ELDERLY TRAUMA PATIENTS WITH ISOLATED RIB FRACTURES TO AN INTENSIVE CARE UNIT IS NOT ASSOCIATED WITH IMPROVED OUTCOMES

Jessica Cox MD, Gregory Jurkovich* MD, Garth Utter* MD, MSc, University of California, Davis

Introduction: Despite the known morbidity and mortality associated with isolated rib fractures in the elderly, there are no widely accepted guidelines for intensive care unit (ICU) admission. We sought to characterize any inter-hospital variability in emergency department disposition of elderly patients with rib fractures. We hypothesized that greater use of ICU admission would be associated with improved outcomes.

Methods: We used the 2015 National Trauma Data Bank to identify patients 65 years or older with isolated rib fractures who were admitted to an ICU, step-down unit, or ward. We excluded patients with a significant injury [Abbreviated Injury Scale (AIS) score >1] other than the chest wall injury, those with GCS <9, and those who were intubated. We categorized hospitals into quartiles based on the proportion of eligible patients admitted to an ICU, excluding hospitals with <10 eligible patients in 2015. The primary outcome was a composite of unplanned intubation, pneumonia, or death. We used logistic regression to evaluate whether hospital-level quartile of ICU-use was associated with outcomes, accounting for clustering of observations within hospitals and patient- and hospital-level characteristics as potential confounders.

Results: Among 10,382 patients at 420 facilities, the mean age was 77±7 years, mean ISS was 8±3, and mean thoracic AIS 2.6±0.8. 31% of patients had 1-2 fractured ribs, 28% had 3-5 fractures, and 14% had >5 fractures; 26% were characterized only as having "multiple" fractures. The median proportion of patients admitted to the ICU per hospital was 17% (IQR 7-31%, range 0-88%). Trauma center level, university affiliation, and Southern or Western geographic region were associated with greater ICU use. Hospital-level quartile of ICU use was not associated with a reduction in the composite adverse outcome (Table), and greater ICU use was associated with increased risks of death and unplanned intubation. Unplanned ICU transfer was no more likely among hospitals with less ICU use. None of the available patient or hospital characteristics confounded these associations.

	Composite Outcome	Death	Unplanned Intubation	Pneumonia	Unplanned ICU Admission
Hospital-level ICU Use	OR (CI 95%)	OR (CI 95%)	OR (CI 95%)	OR (CI 95%)	OR (CI 95%)
1st Quartile – Lowest	Reference	Reference	Reference	Reference	Reference
2nd Quartile	1.30 (0.95-1.78)	1.40 (0.87-2.25)	1.35 (0.77-2.35)	1.03 (0.64-1.65)	1.13 (0.69-1.85)
3rd Quartile	1.18 (0.86-1.61)	1.59 (1.03-2.46)	1.13 (0.66-1.93)	0.73 (0.46-1.16)	1.03 (0.63-1.71)
4th Quartile – Highest	1.28 (0.95-1.73)	1.62 (1.07-2.47)	1.79 (1.05-3.06)	1.03 (0.65-1.62)	1.40 (0.89-2.21)

Conclusions: Admission disposition of elderly patients with isolated rib fractures is highly variable across centers. Hospitalization at a facility that admits a high proportion of such patients to an ICU is not associated with improved outcomes, and may be associated with greater risk of death. Hospitalization at a facility that admits a low proportion of patients to the ICU is not associated with increased risk of unplanned transfer to the ICU. Further research is needed to identify which patients benefit from ICU admission.

Poster # 88

LIFE AFTER 90: OUTCOMES AND PREDICTORS OF MORTALITY IN 4,724 NONAGENARIAN PATIENTS UNDERGOING EMERGENCY GENERAL SURGERY

Manasnun Kongwibulwut MD, Kevin Chiang MD, Jae M. Lee BA, Ask T. Nordestgaard BSc, Ahmed I. Eid MD, MSc, Suzanne F. Van Wijck BSc, Napaporn Kongkaewpaisan MD, Kelsey Han BA, David R. King MD, Peter J. Fagenholz MD, Noelle N. Saillant MD, Martin G. Rosenthal MD, April E. Mendoza MD,MPH, George C. Velmahos* MD,Ph.D., Massachusetts General Hospital

Introduction: The decision to emergently operate on nonagenarian patients (NONAs) can be complex due to the uncertainty about outcomes and goals of care at this advanced age. We sought to: 1) determine the outcomes and predictors of mortality for NONAs undergoing emergency general surgery (EGS) and 2) test the performance of the ACS-NSQIP surgical risk calculator in this subgroup of patients.

Methods: Using the 2007-2015 ACS-NSQIP database, all patients 90 years of age or older who underwent an emergent operation, as defined by ACS-NSQIP, with a CPT code for "digestive system", were included. Multivariable logistic regression analyses were performed to identify independent predictors of 30-day mortality. NONAs mortality rates for different combinations of risk factors were also studied. The actual mortality rates were compared to those predicted by the ACS-NSQIP risk calculator.

Results: Out of a total of 4,456, 809 patients, 4,724 NONAs were included; 67.2% were female and 81.5% were white. The overall 30-day patient mortality and morbidity rates were 21% and 45%, respectively. In multivariable analyses, the key independent predictors of 30-day mortality included recent history of weight loss, history of steroid use, smoking, functional dependence, hypoalbuminemia and sepsis/septic shock. A diagnosis of diabetes, heart failure, or COPD did not independently correlate with 30-day mortality. NONAs with a history of weight loss with either steroid use or sepsis had a 100% and 93% mortalities, respectively. The ACS-NSQIP consistently underestimated the mortality of all NONAs, especially those at the highest risk [Table 1].

Population	Actual 30-day mortality (%)	ACS-NSQIP predicted mortality (%)
All NONAs	21.0	12.0
Recent weight loss and steroid use	100.0	49.0
Recent weight loss and septic shock	93.3	68.0
Steroid use and septic shock	81.3	64.0

Conclusions: Most NONAs undergoing EGS survive the hospital stay, but the ACS-NSQIP calculator underestimated their risk. The combination of recent weight loss with either steroid use or septic shock nearly ensures mortality and should be used in the discussions with patients and families before a decision to operate is made.

Poster # 89

COAGULOPATHY IS ASSOCIATED WITH INCREASED MORTALITY IN GERIATRIC EMERGENCY GENERAL SURGERTY PATIENTS

Vanessa P. Ho* MD,MPH, Nicholas K. Schiltz Ph.D., Andrew P. Reimer Ph.D.,RN, Elizabeth Madigan Ph.D.,RN, Siran M. Koroukian Ph.D., Elliott R. Haut* MD,
MetroHealth Medical Center

Introduction: Coagulopathy is a well-known risk factor for mortality in trauma surgery. It is unknown whether coagulopathy carries a similarly increased risk of mortality for emergency general surgery (EGS). Our aim was to apply a data-driven approach to study mortality associated with coagulopathy, both alone, and in combination with other comorbidities.

Methods: We performed a cross-sectional study of patients aged 65 and older from the 2011 Nationwide Inpatient Sample who underwent EGS, utilizing the AAST ICD-9 classification. Coagulopathy, including inherited and acquired coagulopathy, and other comorbidities, were defined via the Elixhauser comorbidity index. We utilized Association Rule Mining to determine common comorbidity combinations. We calculated adjusted odds of in-hospital mortality for one, two, and three-way comorbidity combinations.

Results: We identified 992,892 encounters, with an overall mortality rate of 5.2%. The most common procedures performed were gastrointestinal (30.3%) and soft tissue (29.8%). Coagulopathy was associated with the highest adjusted mortality rate compared with all other individual comorbidities (adjusted odds ratio [OR]: 3.52, 95% confidence interval [CI]: 3.34 – 3.72, p<.001). Two- and three-way comorbidity combinations with the highest adjusted mortality also included coagulopathy (Table).

Conclusion: For elderly patients undergoing EGS, coagulopathy is the strongest comorbitity risk factor for death, both alone and in combination with other comorbidities. Further studies to examine whether targeted treatment of coagulopathy can improve outcomes should be undertaken.

One-way, Two-way, and Three-way Comorbidity Combinations with the Highest Odds of Death	Adjusted Odds Ratio	95% Confidence Interval
One-way combination		
Coagulopathy	3.52	(3.34 – 3.72)
Fluid and Electrolyte Disorders (FED)	2.79	(2.67 – 2.91)
Weight Loss	2.36	(2.25 – 2.47)
Liver Disease	1.98	(1.78 – 2.20)
Congestive Heart Failure	1.83	(1.74 – 1.92)
Two-way combination		
Coagulopathy & FED	4.36	(4.10 – 4.64)
Coagulopathy & Weight Loss	4.34	(3.97 – 4.74)
Coagulopathy & Peripheral Vascular Disorders	3.83	(3.44 – 4.26)
Coagulopathy & Other Neurological Disorders	3.45	(2.94 – 4.05)
Coagulopathy & Congestive Heart Failure	3.33	(3.02 – 3.67)
Three-way combination		
Coagulopathy & FED & Peripheral Vascular Disorders	5.10	(4.50 – 5.79)
Coagulopathy & Renal Failure & Weight Loss	4.59	(3.97 – 5.30)
FED & Weight Loss & Arrhythmias	2.78	(2.58 – 2.99)
Renal Failure & Weight Loss & Arrhythmias	2.73	(2.46 – 3.03)
Chronic Pulmonary Disease & Weight Loss & Arrhythmias	2.72	(2.45 – 3.02)

Poster # 90

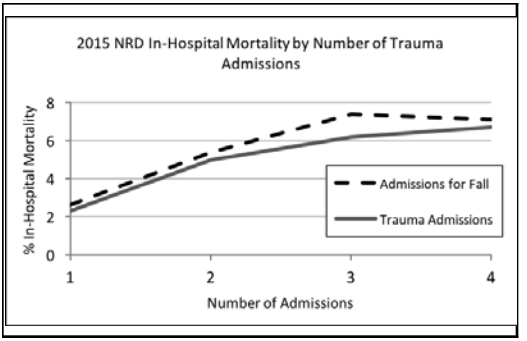
TRAUMA RECIDIVISM IN THE ELDERLY: A NATIONAL AND LOCAL CRISIS

Elliot C. Williams MD, Laura N. Godat* MD, Jay J. Doucet* MD, Todd W. Costantini* MD, University of California, San Diego

Introduction: As the population ages, injury prevention efforts are needed to target elderly patients requiring trauma center readmission after multiple falls. Prior studies on elderly trauma recidivism were limited to single institutions. The goal of this study was to measure rates of elder trauma recidivism nationally and identify potentially modifiable risk factors.

Methods: The Nationwide Readmission Database (NRD) for 2015 and the trauma registry at an urban, Level 1 trauma center (2000-2016) were queried for all patients aged 65 and older who were admitted with a primary diagnosis of trauma. Patients with more than one admission in the database with a primary diagnosis of trauma were labeled recidivists. The index admission for recidivists was compared with non-recidivist admissions with respect to demographics, mechanism of injury (MOI), discharge destination, and mortality.

Results: In the 2015 NRD, there are 373,413 elderly trauma patients, representing a 50% national sample. 16,108 (4.3%) patients were identified as trauma recidivists. Compared to non-recidivists, elderly trauma recidivists were more likely to be initially admitted for a fall (78% vs 68%, $p<0.001$). Recurrent falls were common in recidivists, with 63% having least one additional admission for a fall in the same year. Mortality within the year was doubled for recidivists (5.0% vs 2.3%, $p<0.001$) and continued to increase with each subsequent trauma admission (see Figure). 70% of recidivists presented to the same hospital for all of their trauma admissions. At our institution, a total of 4219 unique patients aged 65 or older were admitted to the trauma center, of which 210 (5.0%) were recidivists. The local rate of recidivism has increased every year since 2010. Modifiable risk factors associated with recidivism at the institution level were alcohol abuse and homelessness.



Conclusion: Trauma recidivism in the elderly is rapidly increasing and is associated with increased mortality. Single institution data for our trauma center shows that alcohol abuse and homelessness are modifiable risk factors. Nationwide data demonstrates that a majority of recidivists will return to the same hospital for subsequent trauma admissions, providing an opportunity for targeted intervention and injury prevention efforts.

Poster # 91

THE UNDERAPPRECIATED FINANCIAL BURDEN OF NON-ADMITTED FIREARM INJURIES.

Keith R. Miller* MD, Amir Motameni MD, Matthew V. Benns* MD, Kim Denzik RN, MSN, Annabelle Pike MBA, Jon R. Chastain Wanda Bowen CAISS, Lindsay Arnold MD, Matthew Bozeman MD, Nicholas Nash MD, Glen Franklin* MD, Brian G. Harbrecht* MD, Jason W. Smith* MD,Ph.D., University Of Louisville

Introduction: Firearm injuries result in significant societal cost burden and individual morbidity and mortality. Large databases compiled from trauma registries and inpatient admissions often neglect to include patients sustaining injuries that are treated in the emergency department but not admitted. These injuries represent a significant portion of overall injuries and are associated with costs not generally recovered by hospitals.

Methods: All firearm injuries evaluated at a Level 1 trauma center from January to December 2017 were prospectively collected and retrospectively anaylzed. All patients treated in the ED and not admitted to an observation or inpatient bed were identified, and demographic, hospital cost, and aggregate hospital reimbursement were collected. Hospital cost was calculated based on department specific cost-to-charge ratios based on the most recently filed Medicare Cost Report. Financial cost (dollars, $) were standardized to December 2017 value, and univariate and multivariate analyses were performed. Values are expressed with +/- standard error (SEM) and Standard Deviation (SD).

Results: Over the study interval, 268 firearm injuries were treated in the emergency department and not admitted. Of the 268 patients, 33 died in the ED prior to admission. Of the survivors, 11% were re-evaluated in the ED at some point following their initial evaluation. The average hospital cost to treat a non-admitted firearm injury was $1,535 (SD +/- $2041, SE +/- $99). Patients who died during treatment in the ED prior to admission had a much higher cost of treatment than those discharged home ($2853 =/- X vs $938 +/- X, $p<0.001$). Total hospital cost to treat non admitted firearm injuries was $524,005. Aggregated reimbursement for the 268 non-admitted patients was $389,080, which represented a $134,925 shortfall. Five year financial modeling of trauma admissions, cost and payments was performed (table 1). Modeling predicted an estimated hospital loss of $674,072 over the next 5 years to care for these injuries.

Conclusion: There is a paucity of data regarding actual hospital reimbursement for care following firearm injury. Patients sustaining firearm injuries that do not require admission are generally excluded from trauma registries and inpatient databases. This group comprised over forty percent of the total number of firearm injuries evaluated at our institution. In addition to significant patient morbidity and mortality, these injuries represent an underappreciated and growing financial burden on urban trauma centers.

	2017	2018	2019	2020	2021	Total Five Year
Trauma Admissions	3526	3833	4166	4404	4611	
Non –Admitted GSW	268	298	324	354	386	
Non- Admitted GSW Total Cost	$524,005	$456,770	$497,879	$ 543,186	$ 592,073	$2,613,913
Estimated Aggregate Hospital Payment	$389,080	$338,923	$369,476	$ 403,044	$ 439,318	$1,939,841
Estimated Hospital Loss	$134,925	$117,847	$128,403	$ 140,142	$ 152,755	$ 674,072

Poster # 92

THE EPIDEMIC OF MASS CASUALTY INCIDENTS IN THE UNITED STATES: A CALL FOR ACTION

Riley Santiago BS, BA, Alison Smith MD,Ph.D., Kareem Ibraheem MD, Jessica Friedman MD, Marcus Hoof BS, Rebecca Schroll MD, Chrissy Guidry DO, Clifton McGinness MD, Juan Duchesne* MD, Patrick McGrew MD, Tulane School of Medicine

Introduction: A mass casualty incident (MCI) is defined by the National Incident Management System (NIMS) as an incident in which the number of patients requiring pre-hospital emergency services overwhelms the local resources. MCIs related to active shooter incidents in the United States have been reported with increasing frequency, which has prompted a call for major changes to how EMS and hospital systems manage MCIs. Most studies of MCIs analyze large-scale events, such as earthquakes, plane crashes, or mass shootings. However no study has provided an analysis of the characteristics of all national MCIs. The aim of this study was to provide a descriptive analysis of MCIs in order to provide guidance for the allocation of resources to these devastating events.

Methods: A retrospective review of the prospectively maintained National EMS Information System (NEMSIS) database was performed. All MCIs from Jan 1, 2010 through Dec 31, 2015 were identified and data was stratified by injury mechanism and separated into blunt and penetrating trauma subgroups. Demographic information and on scene mortality was obtained. Results were analyzed for statistical significance.

Results: A total of 61,789 patients were identified. 60,294 of MCIs were blunt trauma from motor vehicle collisions (97.6%). Although only 2.4% of MCIs were due to penetrating mechanism; the incidence of compressible injuries: extremity (36.1% vs. 30.2%, p=0.0001) and non-compressible injuries: abdominal (10.7% vs. 5.8%, p<0.001) and chest (16.2% vs 12.4%, p=0.03) were higher when compared to blunt trauma MCIs. Penetrating MCIs had higher mortality rate as well, with most of them occurring in the pre-hospital arena (12.9% vs. 2.0%, p<0.001) when compared to blunt MCIs.

Conclusion: Blunt trauma continues to be the most common mechanism in MCIs, though penetrating trauma results in a six-fold higher rate of pre-hospital mortality. Given an increasing surge in MCIs related to penetrating trauma, results from this study raises the awareness for improvement in
pre-hospital interventions that could potentially improve on scene mortality.

Table 1: Mass Casualty Incidents in the United States: A National Six Year Analysis

	Total MCI (n = 61789)	Blunt (n = 60868)	Penetrating (n = 930)	p value
Race, n (%)	50826			
White	31923 (62.8)	31572 (63.1)	351 (45.1)	**< 0.001**
African American	11618 (22.9)	11303 (22.6)	315 (40.4)	**< 0.001**
Location of Incident, n (%)	58841			
Home	1844 (3.1)	1372 (2.4)	472 (60.9)	**< 0.001**
Street	55860 (94.9)	55692 (95.9)	168 (21.7)	**< 0.001**
Public building	368 (0.6)	323 (0.6)	45 (5.8)	**< 0.001**
Recreational place (clubs)	254 (0.4)	239 (0.4)	15 (1.9)	**< 0.001**
Restaurant/Bar	515 (0.9)	440 (0.8)	75 (9.7)	**< 0.001**

Poster # 93

IS OPIOID PRESCRIBING DRIVING TRAUMA RECIDIVISM OR IS TRAUMA DRIVING OPIOID USE?

Laura A. Harmon MD, Leah Sukri BS, Joseph A. Kufera MS, Andrew Nguyen MD, MeiLin Grunnagle BS, Christine L. Ramirez MD, Cristina B. Feather MD, Isadora Botwinick MD, Thomas M. Scalea* MD, Deborah M. Stein* MD,MPH, University Of Maryland R Adams Cowley Shock Trauma Center

Introduction: Opioids are commonly used to treat pain after trauma. In the past 30 years, opioid prescription rates have quadrupled and hospital admissions for opioid overdose are rising. Previous studies have focused on alcohol use and trauma recidivism. However, there are no studies looking at recidivism and opioid use. We hypothesized that there is an association between opioid use and trauma recidivism.

Methods: We retrospectively reviewed patients admitted more than once for trauma from 2007-2017. Demographics, opioid toxicology screen (TS) on each admission, and injury characteristics were collected. Statistical analysis was performed with Chi-square and Poisson regression models.

Results: 1649 patients (age ≥18) had multiple trauma admissions. 61% were non-black, 82% male, and 34% were between the ages of 18–29, which was the most represented age group. The mean duration between first and second admissions was 18 months. 25% had an ISS >15 on their 2 nd admission. 11% sustained penetrating trauma on their 1st admission which increased to 19% on the recidivist admission. 12% of recidivists had a diagnosis of alcohol dependency and 15% a diagnosis of drug abuse. Of the 709 who had opioid screening on both admissions, 31% (218) were TS-positive on the 1st admission compared to 34% (244) on their 2nd admission. 17% of patients who were TS-positive on 1st admission were positive on their 2nd, while 18% who were TS-negative on 1st admission were subsequently positive on their 2nd admission ($p<0.0001$). Patients who were TS+ on the subsequent admission were less severely injured than those who were TS- (ISS >15, 26.3% vs 22.3%, $p=0.04$). The only significant risk factor for TS+ on the 2nd admission was TS+ on the 1st admission (RR 2.18, $p<0.001$). However, age >60 (RR=0.67, $p=0.08$) and ISS >25 trended toward a protective effect (RR 0.62, $p=0.13$).

Conclusion: A previous history of opioid use is the strongest predictor of recurrent use in recidivists. However, nearly 20% of our patients were opioid negative on 1st admission but subsequently opioid positive on their 2nd. The opioid epidemic is ravaging the US and opioid prescribing practices are clearly contributing to this issue. Acute pain associated with trauma is often treated with opioids and may be inadvertently contributing to injury recidivism.

Poster # 94

MULTIMODALITY THERAPY DECREASES OPIOID USE WHILE MAINTAINING PAIN CONTROL AND PATIENT SATISFACTION IN INPATIENT PAIN MANAGEMENT FOR TRAUMA PATIENTS

Jessica L. Gross MD, Anna N. Miller MD, Allyson K. Bryant MD, Margaret R. Rukstalis MD, Robert S. Weller MD, Jose-Franck Diaz-Garelli Ph.D., Gerald J. Rebo PharmD, Kristin A. Rebo PharmD, Christen M. Seguin MSN, Paul F. Smith Amy Chang Preston R. Miller* III, MD, Wake Forest University School of Medicine

Introduction: Prescription opioids are often used to control pain after injury or surgery. Unfortunately, opioid addiction and its sequelae have reached epidemic proportions in the United States, and sales of prescription opioids have nearly quadrupled between 1999 and 2014. Opioid prescribing has played a major role in today's opioid epidemic and 40% of opioid deaths in the United States are due to prescription opioids. Acknowledging this worsening crisis, our trauma service created a pain management protocol (PMP) for patients admitted to the trauma service. Our goal was to decrease opioid use while maintaining pain control and patient satisfaction.

Methods: A multidisciplinary team (trauma, orthopedics, anesthesiology, psychiatry, pharmacy, and information technology) designed the PMP to standardize opioid prescribing on the inpatient trauma service. The PMP provided a step wise approach to pain control: Acetaminophen or ibuprofen for mild pain, 5 mg oxycodone/ 325 mg acetaminophen every 6 hours as needed for moderate to severe pain (maximum of 8 tablets/24 hour period), and tramadol (50 mg to 100 mg) every 6 hours as needed for breakthrough pain. The opioid containing oral medications were staggered to allow administration of oral pain medications every 3 hours as needed. Long acting oral opioids such as extended release oxycodone or extended release morphine were added as needed. We also encouraged use of adjunct pain medications (gabapentin, pregabalin) that would address neuropathic pain. We performed a retrospective review to compare the amount of opioid medication (converted to morphine milligram equivalents –MME) given during their inpatient stay before and after the implementation of the PMP **.** The study period covered 2 years with initiation of the PMP at the halfway point. The Wilcoxon Rank Sum Test was used to compare means and chi-squared test was used to compare categorical variables.

Results: Between January 1, 2015 and December 31, 2016, 3696 patients were managed on the inpatient trauma service; 1670 in the before arm(B) and 2026 in the after(A) arm. The average total opioid dose per patient was higher in the B as compared to the A group (B: 700.67 MME, A: 558.11 MME, $p<0.0001$). The mean opioid dose per patient per day showed a similar pattern (B: 95.63 MME, A: 82.71 MME, $p<0.0001$). Increased use of acetaminophen ($p<0.0001$) and neuropathic pain agents ($p<0.0001$) was associated with the decreased opioid use. The Press Ganey scores for pain control (B: 49%, A: 53% $p<0.07$) and overall patient satisfaction (B: 94%, A: 91% $p<0.33$) did not worsen after implementation of the protocol.

Conclusion: A PMP for the trauma service created by a multidisciplinary team was associated with decreased opioid use while maintaining patient satisfaction and the patient's perception of pain control. We hope that this protocol may serve as a bridge to decreased overall opioid use in this difficult population.

Poster # 95

DECREASED OPIOID USE FOLLOWING IMPLEMENTATION OF A PILL-BASED, MULTI-MODAL PAIN REGIMEN IN TRAUMA PATIENTS

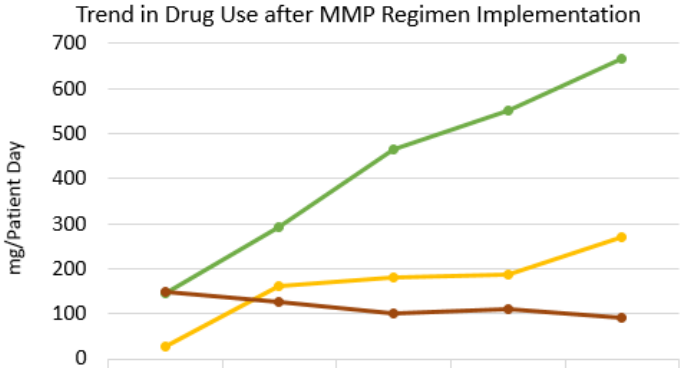
Shuyan Wei MD, Brad Domonoske PharmD, Teri Ogg PharmD, Rondel Albarado* MD, Jaideep Mehta MD, Charles Green Ph.D., Lillian S. Kao MD, John A. Harvin* MD, University of Texas Health Science Center-Houston

Introduction: In 2013, our level-1 trauma center implemented an oral multi-modal pain (MMP) regimen based on best available evidence to decrease opioid consumption. The MMP regimen scheduled non-opioid medications as first-line agents, supplemented by oral/intravenous opioids as needed. This study describes the pattern of opioid administration to trauma patients following implementation of MMP. We hypothesized that the MMP regimen resulted in decreased opioid consumption in trauma patients.

Methods: We retrospectively reviewed administrative data from 2013 - 2017. Oral and intravenous opioids were converted to oral morphine milligram equivalents (MME) based upon Center for Disease Control guidelines. The number of opioid vials delivered to patient controlled analgesia
(PCA) devices was also collected. However, the quantity of MMEs used per PCA vial could not be determined as unfinished vials were discarded.

Results: Total patients-days during the study period were as follows: 30,681 (2013), 31,777 (2014), 30,144 (2015), 32,736 (2016), and 30,898 (2017). Acetaminophen use appeared constant (ranging from 75,814,115 to 93,954,729 mg/year). The number of PCA vials distributed to trauma patients dropped from 2,908 in 2013 (8 vials per day) to 317 in 2017 (< 1 vial per day). Over the six year period, non-steroidal anti-inflammatory drugs (NSAIDs) and gabapentinoid prescribing increased dramatically. The MME/ patient-day fell from 148 in 2013 to 90 in 2017, a 39% decrease (**Graph**).

Conclusion: Implementation of a pill-based, MMP regimen reduced opioid use by 39% in hospitalized trauma patients. Further research is warranted to better understand the economic and social impact of a multi-modal approach to pain management in trauma populations.



	2013	2014	2015	2016	2017
NSAIDs/Patient Day	27	160	181	186	271
Gabapentinoids/Patient Day	146	293	464	550	665
MME/Patient Day	148	127	101	110	90

Poster # 96

THE ROLE OF HIV IN POST-INJURY COAGULATION

Anamaria J. Robles MD, Lucy Z. Kornblith MD, Amanda S. Conroy RN, Mitchell J. Cohen* MD, Rachael A. Callcut* MD, MSPH University of California, San Francisco

INTRODUCTION: HIV infection is known to produce a chronic hypercoagulable and pro-inflammatory state; viral replication leads to decreases in several anti-coagulant factors and increases in pro-coagulant factors. Although antiretroviral therapy (ART) decreases replication, low-level inflammation and immune activation persist. However, the impact of HIV on post-injury coagulation milieu is unknown.

METHODS: Data were collected on 1349 injured patients from 2005-2016; thromboelastography, coagulation factor activity, and standard coagulation measures were measured. Multiple regression analysis was performed to determine the independent association of HIV on post-injury coagulation.

RESULTS: Thirty-nine (3%) HIV patients were identified. 18 (46%) were on ART, with 24 (69%) having history of ART treatment; the median CD4 count was 399 (227-536 cells/mm^3). HIV-infected patients trended towards being older (43 vs 37 years, p=0.051) and had significantly lower BMI (24 vs 26 kg/m^2 p=0.007), WBC (7.8 vs 9.8 10^3/μL, p=0.011), hemoglobin (13 vs 14 g/dL, p<0.001), and platelet counts (239 vs 269 10^3/μL, p=0.005). HIV patients were hypercoagulable by citrated rapid TEG (CRT) (alpha angle 77 vs 74° , p=0.001; K time 0.95 vs 1.4 sec, p=0.005) and had lower antithrombin activity (77 vs 90%, p=0.049). On multivariate analysis, HIV was independently associated with a hypercoagulable state including significantly increased CRT-alpha angle (mean +4.90°, p=0.021) and lower antithrombin activity (mean -17.64%, p=0.046).

Table: Multivariate Associations of HIV on Coagulation

	Mean Difference	SE	*p*-value
CRT R-time (min)	-0.217	0.268	0.418
CRT K-time (min)	-0.550	0.375	0.143
CRT alpha angle (°)	4.900	2.112	**0.021**
CRT MA (mm)	0.113	2.653	0.966
CRT ly30 (%)	0.285	1.143	0.804
Antithrombin (% activity)	-17.642	8.850	**0.046**

*All TEG multivariate comparisons controlling for age, gender, injury severity, initial WBC and initial platelet count on admission

CONCLUSION: The impact of HIV on post-injury coagulation is unknown and our findings suggest that following injury HIV infection independently contributes to laboratory evidence of hypercoagulability. Further investigations of this study population may help elucidate the complex crosstalk between coagulation and inflammation following injury.

Poster # 97

THE IMPACT OF MARIJUANA LEGALIZATION ON RISK OF TRAUMATIC INJURY

Christine Chung DO, Kristin Salottolo MPH, Robert Madayag MD, Allen Tanner II, MD, David Bar-Or MD, Swedish Medical Center

Introduction: The medical legalization of marijuana has been shown to result in an increased risk of injuries. In Colorado, marijuana was effectively legalized for commercial sale on January 1, 2014, resulting in rapid proliferation of its availability. The objective of this study was to determine the association between commercial marijuana legalization and drug test results following traumatic injury.

Methods: This retrospective cohort study included all patients admitted with a traumatic injury to two Colorado trauma centers between 1/1/2012-12/31/2015, two years before and two years after legalization of marijuana in Colorado. Generalized linear models (GLM) and Pearson chi-square tests were used to examine changes (pre/post and across eight six-month periods) in the prevalence of urine drug screen (UDS) testing, a positive UDS for marijuana (+THC [tetrahydrocannabinol]), a positive UDS for other drugs (+Drugs; amphetamines, cocaine, opiates, benzodiazepene, barbiturates, or PCP), and a positive blood alcohol content (+BAC, ≥ 80 mg/dl). The analyses were performed for all trauma admissions and the subset that required a full trauma team activation.

Results: There were 14,345 admissions over the study period, including 2,939 trauma activations. The rate of UDS testing did not change over time (p=0.66), and was greater in activated patients than all admissions (25% vs. 11%). The prevalence of +THC was borderline significantly higher after legalization of marijuana (table 1). The increasing rate of +THC was significantly greater
post-legalization (p=0.02) in activated patients, whereas the rate of increase was similar across time periods in the overall population (p=0.78). There was a significant decrease in +Drugs findings post-vs. pre-legalization; however, the rate of change demonstrated decreasing rate of
+Drugs pre-legalization and an increased rate of +Drugs post-legalization (p<0.001). There was a significant decrease in +BAC post-legalization; however, this rate of decrease was similar pre- and post-legalization. The characteristics of +THC patients were similar pre- vs. post-legalization, except an increase in males (72% vs. 80%, p=0.04) and a decrease in MVCs (54% vs. 44%, p=0.02). There were no other differences in demographics, injury characteristics, or outcomes.

Conclusion: With the growing number of trauma patients testing positive for marijuana in Colorado, these data suggest that commercial legalization was associated with an increased rate of marijuana use with traumatic injury, but only for those requiring full trauma activation. A larger study is underway to add additional years and to compare Colorado and non-Colorado hospitals.

Table 1. Change in Urine drug screen findings (UDS) before and after legalization of marijuana in Colorado

UDS finding	Overall (14,345)				Full activation (2,939)			
Result	Pre-legalization (7,110)	Post-legalization (7,235)	*p* value[1]	*p* value[2]	Pre-legalization (1,507)	Post-legalization (1,352)	*p* value[1]	*p* value[2]
+THC	26.6%	30.6%	0.07	0.78	27.3%	32.9%	0.10	**0.02**
+Drugs	50.4%	44.2%	**0.01**	**<0.001**	48.8%	45.0%	0.30	**<0.001**
+BAC	39.7%	29.9%	**0.05**	>0.99	43.0%	32.4%	**0.005**	0.10

[1]Chi-square test.
[2]Generalized linear model (rate of change, pre vs. post)
+THC, tetrahydrocannabinol (marijuana); +Drugs, amphetamines, cocaine, opiates, benzodiazepine, barbiturates, or PCP; +BAC, blood alcohol content ≥ 80 mg/dl.

Poster # 98

MENTAL HEALTH SERVICE CONSULTATION FOR PTSD SYMPTOM REDUCTION AFTER INJURY: MORE IS BETTER

Robert G. Sise MBA,MD,MPH, Douglas F. Zatzick MD, Joan Russo Ph.D., Richard Y. Calvo Ph.D., Michael J. Sise* MD, Ronald V. Maier* MD, University of Washington

Introduction: Between 20-40% of trauma patients report high levels of posttraumatic stress disorder (PTSD) symptoms. Although mental health services have shown promise in reducing PTSD symptoms, little is known regarding the impact of these services when provided during the index trauma hospitalization. We hypothesized that increases in both the diversity of services and the number of visits patients receive across all services are associated with a decrease in PTSD symptom severity.

Methods: We conducted a retrospective cohort study of 207 patients who participated in a randomized mental health intervention trial between 04/2006-09/2009 at an urban Level I trauma center. The primary exposures were the type of mental health consultation service provided to patients and the number of times patients were visited by each service as documented in the patient medical record. Service types evaluated included social work, addiction intervention, rehabilitation psychology, and consult-liaison psychiatry. The primary outcome was a reduction in PTSD symptoms at follow-up compared with baseline as assessed by the PTSD Checklist-Civilian Version (PCL-C). Multiple linear regression was used to assess the association between types of mental health consultation services received and the number of visits the services provided versus PCL-C score change.

Results: Patients were young (mean: 38.5 years), 52% male, had a mean ISS of 13.6, and an average hospital length of stay of 9 days. Consult service utilization was 89% for social work, 22% for addiction intervention, 17% for rehabilitation psychology, and 8% for consult-liaison psychiatry. After multivariable adjustment, neither service type nor diversity of services received was associated with PCL-C reductions. However, a higher number of visits provided across all services was significantly associated with reductions in PCL-C (0.3 point reduction per visit). This association remained significant even after adjusting for covariates including the number of prior traumas.

Conclusion: An increased number of consultation visits across all services was significantly associated with PTSD symptom reduction. Trauma centers should consider this when developing PTSD symptom management guidelines. : An increased number of consultation visits across all services was significantly associated with PTSD symptom reduction. Trauma centers should consider this when developing PTSD symptom management guidelines.

Variable	β Coefficients	SE	95% CI	*p*
Initial PCL-C Score	0.433	0.066	0.303, 0.562	0.000
Total number of visits across all services	-0.301	0.129	-0.555, -0.047	0.020
Number of prior episodes of trauma	0.552	0.241	0.076, 1.028	0.023
SE, standard error; CI, confidence interval				

Poster # 99

OUTCOME AND ECONOMICS OF FIREARM INJURY BY BODY REGION AND THE FINANCIAL TOLL ON AN URBAN TRAUMA CENTER.

Keith R. Miller* MD, Matthew V. Benns* MD, Annabelle Pike MBA, Kim Denzik RN, MSN, Wanda Bowen CAISS, Jon R. Chastain Amir Motameni MD, Lindsay Arnold MD, Matthew Bozeman MD, Nicholas Nash MD, Glen Franklin* MD, Brian Harbrecht* MD, Jason W. Smith* MD,Ph.D., University Of Louisville

Introduction:Firearm injuries result in significant societal cost burden and individual morbidity and mortality. Outcomes and cost following firearm injury are intuitively associated with the location of injury but limited data are available. Although charges and cost are commonly reported, there is a paucity of data regarding actual hospital reimbursement.

Methods:Firearm injuries at a Level 1 trauma center from Jan 2012-November 2017 were examined retrospectively. Demographic data and injury patterns were abstracted from the registry and charts. Hospital cost was calculated from department specific cost-to-charge ratios based on the most recently filed Medicare Cost Report. Financial costs (dollars, $) were standardized to 2017 value, and univariate and multivariate analysis was performed. Values are expressed with +/- standard error (SEM) and Standard Deviation (SD).

Results:During the study interval, 19,102 patients were admitted following trauma of which 1,430 were firearm injuries (7.5%). 1075 injuries (75 %) involved single GSWs to an isolated body region. Demographic, cost, and outcome data are noted in Table 1. Overall, average total hospital cost of treating all firearm injuries was $17,545 (SEM +/- $949; SD +/- $20410). Patients who survived initial injury had significantly higher costs than those succumbing to injuries ($28,230 +/- 5260 vs $6836 +/- 5011, p=0.001). Rank sum ANOVA identified GSW location (Head P<0.001; Abdomen P<0.01, and Chest P<0.01) as predictors of increased cost, however ISS (p=0.506) and LOS (p=0.167) did not predict total cost in regression modeling. GSW location significantly predicted depression scores [b =-0.0000195, t(0.0001) = -6.261, p < .001] and total cost [b = 1.578, t(0.179) = 8.829, p <0.001]. Additionally, GSW location explained a proportion of variance in both variables [R2=0.426, F=(3,283) 87.168, p < .001]. Overall cost of care for firearm injuries was $25.1 million. Aggregated payments to the hospital were $22,253,182. Over the study period, the hospital lost $2,846,818 ($474,470/ annually) to care for firearm injuries.

Conclusion:
In the setting of isolated body region firearm injuries, there are significant differences with regard to survival and cost dependent upon location of injury. Overall, aggregate hospital payments did not cover the cost of care. Given increasing prevalence, the cost for caring for firearm injury will soon become prohibitive for urban trauma centers.

Body Region (n)	Mortality (%)	LOS (Days)	ICU LOS (Days)	ISS	Urgent (Day 0) Operation (%)	# Blood Products (Units)	Hospital Cost per Injury (2017$)
Head (254)	58	6.4	3.4	21.8	21	2.7	22,091
Chest (162)	22	6.6	2.2	14.9	39	5.9	16,363
Abd (176)	11	9.6	2.9	11.9	86	5.7	25,532
Extremity (385)	0.01	3	0.3	7.4	78	0.8	10,947

Poster # 100

POST-OPERATIVE OPIOID PRESCRIBING IN EMERGENCY GENERAL SURGERY – THE SURGEON'S ROLE IN REDUCING OPIOID EXPOSURE

Celina Nahanni Ph.D., Avery B. Nathens* MD,MPH,Ph.D., Sunnybrook Health Science Centre

Introduction: Here we report post-operative narcotic administration in-hospital and on-discharge for opioid naïve patients who underwent laparoscopic emergency surgery at an academic health sciences center. The purpose of this study was to develop guidelines for narcotic administration that would reduce exposure without compromising pain management.

Methods: NSQIP data for 2015-2017 was used to identify patients (N=138 patients) who were managed surgically for either acute appendicitis or cholecystitis. Medication administration, pain scores and prescription information was abstracted from patient charts and opioid doses were converted to oral-morphine-equivalents (OME).

Results:The total quantity of opioids administered in hospital was 12.2 OME in the 24-hrs following surgery; approximately one-third of patients did not require any opioids. Non-narcotic adjuvant medications were administered to 67.4% of patients; all of these included management with acetaminophen while 5.1% were also treated with NSAIDs. Upon discharge, patients were prescribed an average total of 81.3 OME. All discharge prescriptions included opioids and over half of were for opioids alone, the remainder included acetaminophen. The average daily maximum prescribed was three-times that which was required in hospital. Further, the amount prescribed at discharge did not correlate with either the average in-hospital pain score (Pearson=0.05, p=0.71) or in-hospital opioid-consumption (Pearson= -0.02, p=0.42).

	N	Ward first 24hrs -total dose (OME)	Ward, first 24hrs - % multimodal	Rx- % multimodal	Rx total (OME)
Appendectomy	90	10.8(12.0) 32% required no opioids	68.9% 68.9% Acetaminophen 5.6% NSAIDs	36.7%	78.0(34.6)
Cholecystectomy	48	13.8(21.9) 29% required no opioids	65.0% 65% Acetaminophen 4% NSAIDs	48.0%	87.6(32.7)
Average	140	12.2(16.1) 31% required no opioids	67.4% 67.4% acetaminophen, 5.1% NSAIDs	40.6%	81.3(34.2)

Conclusion: Non-narcotic pain medication was not consistently provided as a first line treatment and there was an underutilization of NSAIDs. Prescriptions were frequently for narcotics alone and the high variability in the amount prescribed was not associated with actual patient need. Based on the results of this study, we recommend a default pain management plan that includes non-narcotic pharmacotherapy, including NSAIDs, as a first line therapy. Further, we recommend a standardized prescription that includes separately prescribed non-narcotic adjuvants and discharge instructions that educate patients to reserve opioids for break-through pain.

Poster # 101

IMPACT OF PATIENT FRAILTY ON MORBIDITY AND MORTALITY AFTER COMMON EMERGENCY GENERAL SURGERY OPERATIONS

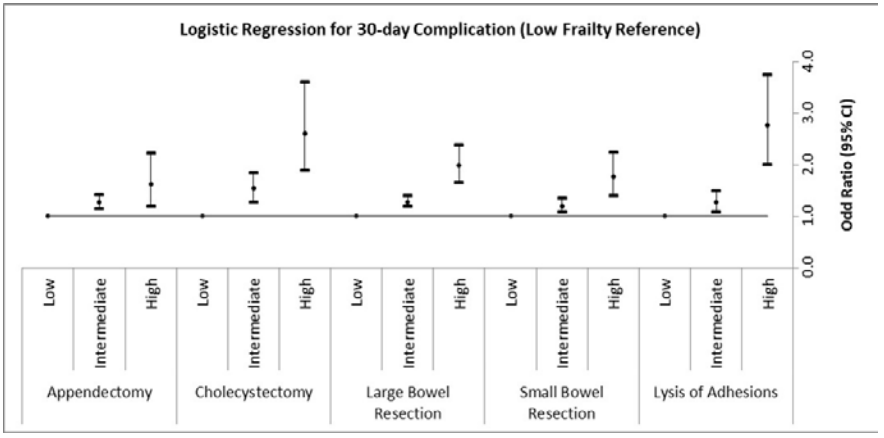
Patrick B. Murphy MD,MPH, MSc, Stephanie A. Savage* MD, MS, Ben L. Zarzaur* MD,MPH,
Indiana Univesity School of Medicine

Introduction: Frailty has been increasingly recognized as a modifiable risk factor prior to elective general surgery. There is limited evidence regarding the association of frailty with peri-operative outcomes after specific emergency general surgery procedures. Our objective was to determine the association between patient frailty and 30-day morbidity, mortality and discharge destination in adult patients undergoing emergency general surgery.

Methods: A retrospective cohort study of 57 173 patients older than 40 years of age from 2010-2014 American College of Surgeons National Surgical Quality Improvement Program (NSQIP) who underwent appendectomy, cholecystectomy, partial large bowel resection, total large bowel resection, small bowel resection or lysis of adhesions on an emergent basis. The modified frailty index (mFI) using a composite of 11 NSQIP variables was used to stratify patients into low (≤0.18), intermediate (0.18-0.35) and high (≥0.36) frailty states. Multi-variable regression modeling included age, sex, mFI, tobacco use, renal failure, steroid use, pre-operative sepsis and outside transfer status.

Results: A total of 57 173 patients underwent appendectomy (n = 26 067), cholecystectomy (n = 8 138), large bowel resection (n = 12 107), small bowel resection (n = 6 503) or lysis of adhesions (n = 4 358) on an emergent basis. Of these patients, 25.0% experienced a complication, 3.2% died in hospital and 5.1% died within 30 days. The majority of the population (52.3%) had low frailty and 3.6% were identified as highly frail. On univariate analysis frailty was related to complication rate (low mFI, 17.5%, intermediate, 31.5% and high, 55.5% complication rate) and inversely related to discharge destination (70.5%, 62.3% and 29.7% discharged home respectively). On multivariable regression, regardless of procedure, intermediate and high mFI were independent predictors of any complication, serious complication, death within 30-days and discharge to a destination other than home, Figure 1.

Conclusion: Frailty is associated with worse outcomes after common emergency surgeries independent of age, co-morbidities and pre-operative sepsis. Assessment of frailty prior to emergency surgery can inform patients and surgeons on expected post-operative outcomes, including discharge disposition, and may impact decision making to proceed with intervention.



Poster # 102

READMISSION AFTER EMERGENCY GENERAL SURGERY

Katherine Kelley MD, Jay Collins* MD, LD Britt* MD, DaShaunda D. Hilliard MPH, Rebecca Britt MD, Eastern Virginia Medical Center

Introduction: Readmission rates are an important metric both because they enable an evaluation of care and because they affect Medicare funding. Patients undergoing emergency general surgery procedures are an important and not fully studied subset of surgical patients. This study evaluates factors contributing to readmission after emergency general surgery.

Methods: The Virginia Health Information database was used to identify patients that had undergone one of the seven most common emergency general surgery procedures in the state of Virginia from January 2011-June 2016. Records were excluded if there was insufficient data about insurance or readmission status, if patients were already readmitted or had been transferred, were <16 years of age, were admitted for trauma, or were military, research, jail, foreign or hospice patients. Demographic, admission, discharge and readmission data were compiled. Comorbidity information was collected for patients from Oct 2015-June 2016. Bivariate and multivariate analyses were performed assessing for both 30 and 90 day readmission.

Results: There were 121,223 records that met initial inclusion criteria. After exclusions there were 83,266 records. The number of readmissions in 30 days was 7995 (9.6%) and in 90 days was 12,329 (14.8%). In multivariate analysis the factors found to be significant ($p<0.05$) in contributing to 30 day readmission were government assistance vs private insurance, longer length of stay, emergent admission (compared to urgent or elective), discharge to rehab, skilled nursing facility, or intermediate medical care facility or with home health, congestive heart failure, liver disease, metastatic cancer, rheumatoid arthritis, coagulopathy, weight loss and anemia. For 90 day readmission the same factors were all significant with the addition of the following significant factors: transfer to psychiatric facility, renal failure, solid tumor without metastasis, weight loss and alcohol abuse.

Conclusion: This study has identified several factors that contribute to readmission after emergency general surgery. Inclusion of both 30 and 90 day readmission enables assessment of late patient morbidity that is otherwise missed by only assessing for 30 day readmission. By identifying these factors interventions can be directed towards those patients at greatest risk for readmission.

Poster # 103

WHICH HOSPITAL METRIC SHOULD WE TRUST FOR EMERGENT SURGERIES: MORTALITY OR READMISSIONS?

Ambar Mehta MPH, Nicole Lunardi MSPH, David T. Efron* MD, Alistair Kent MD,MPH, Raymond Fang* MD, Anuradha R. Kar MD, Elliott R. Haut* MD,Ph.D., Joseph V. Sakran MD,MPH, MPA Johns Hopkins School of Medicine

Introduction: The Centers of Medicare and Medicaid Services publicly reports hospital mortality and readmission rates for elective services. However, little data exists regarding the efficacy of these quality metrics for emergent surgeries. The purpose of this study was to identify any correlation between hospital mortality and readmission rates from emergent surgeries.

Methods: Using the 2005-2015 Maryland Health Services Cost Review Commission (HSCRC) database, we identified patients undergoing one of 12 emergency general surgeries (EGS), as established by AAST criteria. The HSCRC database captures all readmissions, both to index and non-index hospitals. Hospitals performing fewer than 100 EGS procedures annually were excluded. After dividing hospitals into quartiles by their risk-adjusted in-hospital mortality rates, we used a multivariable logistic regression to compare 30-day readmission rates between the quartiles. We also calculated the association between each hospital's risk-adjusted in-hospital mortality and 30-day readmission rates and then assessed whether hospital rankings differed when using in-hospital mortality rates versus 30-day readmission rates. All analyses adjusted for patient factors, EGS procedures, surgeon volume, and hospital clustering.

Results: We identified 169,135 EGS operations performed at 41 hospitals. The overall in-hospital mortality rate was 2.1% and 30-day readmission rate was 10.0%. After risk-adjustment, the lowest mortality quartile of hospitals did not also have a statistically lower rate of 30-day readmissions relative to the highest mortality quartile (8.2% vs 11.4%, aOR 0.83 [95%-CI 0.55-1.26], P=0.38). Similarly, there was no association (r-coefficient=0.01) between each hospital's mortality rate and its readmission rate (Figure 1). There also existed significant variation among hospitals when ranking was performed by either in-hospital mortality rates or 30-day readmission rates (Figure 2). Only 3 hospitals (7.3%) were ranked in the top ten by both mortality and readmission rate.

Figure 1 (N=41 hospitals)

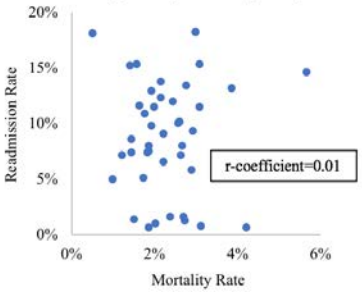
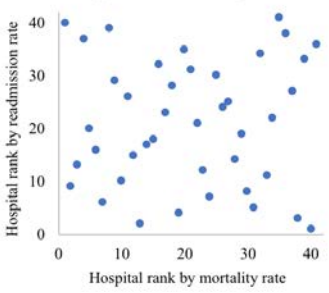


Figure 2 (N=41 hospitals)



Conclusion: Risk-adjusted in-hospital mortality and 30-day readmission rates for individual hospitals did not correlate for EGS procedures. These findings highlight the need to develop a standardized set of quality metrics that universally recognize the same high-performing hospitals and that distinct performance improvement initiatives will be required to address each of these two critical clinical outcomes.

Poster # 104

MOBILE REDCAP SYSTEM FOR DOCUMENTATION OF AAST ACUTE CARE SURGERY FELLOWSHIP SUPERVISION

Oliver L. Gunter* MD,MPH, Oscar D. Guillamondegui* MD,MPH, Raeanna C. Adams* MD, Addison K. May* MD, Bradley M. Dennis* MD, Vanderbilt University Medical Center

Introduction: A graded increase in independence is a vital component of AAST Acute Care Surgery (ACS) fellowship training and mandates the ability to appropriately document trainee supervision and competence. There is currently no standard for documenting supervision of ACS fellows. The objectives of this study were (1) to demonstrate a mobile app system used for document a supervision of ACS fellows, (2) to demonstrate a reproducible assessment tool for proctoring and supervision, and (3) to report initial results of our proctoring system.

Methods: All AAST ACS fellows in our program are proctored, instructor-level faculty. Supervision was defined as: type 1 direct face-to-face, type 2a immediately available in-house, type 2b available after notification via phone with remote electronic medical record access, and type 3 retrospective review. Our proctoring system provides type 1 or 2a supervision for all trauma resuscitations and trauma/EGS operative cases during an initial period, defining our focused physician practice evaluation (fPPE) system. Using research electronic data capture system (REDCap) a database was created to document proctoring in 6/2016. Data collected were patient identification number and clinical summary, ACS fellow, proctoring faculty, service (trauma vs emergency general surgery [EGS]) and type of supervision. The database was updated in 2017 for the next cycle of trainees to include qualitative fields using a Zwisch scale to assess level of autonomy, and operative vs nonoperative data. fPPE data were collated and reviewed by a clinical competency committee after completion of the proctoring period. As fellows are deemed competent, they are graduated to an ongoing physician practice evaluation system (oPPE) that allows type 2b and 3 supervision at faculty discretion. All data were collected by 11 supervising faculty using mobile devices on the REDCap mobile app and uploaded to the database. Data were analyzed using REDCap reporting tools. An online search was performed to identify REDCap partners and approved AAST ACS fellowships.

Results: In 2016 we recorded a total of 203 proctoring events during the fPPE period. The majority of supervision was type 1 or 2a (98.5%). Trauma comprised 68% of events; EGS made up 32%. After updating the database in 2017, we recorded a total of 176 proctoring events. Type 1 or 2a supervision comprised 97% of proctoring events. Trauma events were 62% compared to EGS 38%. 51% of the proctoring events were operations; the remaining 49% were trauma resuscitations. Guidance provided was supervision only in 89% of cases vs 11% requiring some degree of faculty input. Fellows' performance was graded as average in 62% of cases and above average in 38% with one critical deficiency. Case complexity was: Easiest (6, 3.4%), Average (137, 78.3%), Hardest (32, 18.3%).

Conclusion: A REDCap mobile data collection tool is well-suited for documentation of ACS fellows' proctoring and was able to be utilized by all of our ACS faculty to record supervision. A combination of clinical and objective data are useful to determine ACS Fellows' autonomy as a basis for promotion from fPPE to oPPE. This tool helps target remediation and education by identifying below average performance in individual clinical cases. While most proctoring activities were supervision only, 11% required faculty input indicating the benefit of faculty involvement in our proctoring system.

Poster # 105

EFFECT OF TRANSFER STATUS ON OUTCOMES OF EMERGENCY GENERAL SURGERY PATIENTS

Jennifer L. Philip MD, Xing Wang Ph.D., Sara Fernandes-Taylor Ph.D., Jessica Schumacher Ph.D., Megan C. Saucke MS, Jeffery Havlena MS, Caprice C. Greenberg MD,MPH, Heena P. Santry* MD, Angela M. Ingraham MD, MS University Of Wisconsin - Madison

Introduction: Transferred emergency general surgery (EGS) patients are a vulnerable, high acuity population. Outcomes among transferred (TRAN) vs directly admitted (DA) patients have primarily been studied using single institution or hospital system data limiting generalizability. We evaluated outcomes among these EGS patients using a large national dataset.

Methods: We identified patients aged ≥18 years with an American Association for the Surgery of Trauma-defined EGS diagnosis in the 2008-2013 Nationwide Inpatient Sample (NIS). Multivariable regression analyses determined if transfer status independently predicted in-hospital mortality (by logistic regression), morbidity (number of complications; by Poisson regression), cost (by log-linear regression), and length of stay (LOS; by log-linear regression) accounting for the NIS sampling design.

Table. Factors Associated with Outcomes of Emergency General Surgery Patients[±]

	Mortality	**Morbidity**	**Cost,** (log($))	**Length of stay**, (log(days))
Predictor	Adjusted Odds Ratio (95% CI)	Percent Change	Percent Change	Percent Change
Transfer status				
Transferred (TRAN)	1.91 (1.79-2.03)	26.21*	10.76*	19.02*
Directly Admitted (DA)	Ref	Ref	Ref	Ref
Gender				
Male	1.21 (1.18-1.23)	12.65*	0.56*	101.02*
Female	Ref	Ref	Ref	Ref
Age	1.05 (1.05-1.05)	1.29*	0.30*	0.47*
Primary Insurance				
Medicare	1.01 (0.97-1.05)	14.72*	7.13*	8.05*
Medicaid	1.42 (1.34-1.51)	16.66*	7.80*	9.30*
Self-pay	1.22 (1.13-1.32)	-2.64$^{\Delta}$	0.06	-0.14
No charge	0.91 (0.71-1.16)	-6.55$^{\Delta}$	2.81*	1.39*
Other	1.49 (1.34-1.66)	5.12*	2.40*	4.29*
Private	Ref	Ref	Ref	Ref
Charlson Comorbidity Index				
1	1.53 (1.48-1.59)	34.06*	11.98*	9.81*
2	2.16 (2.08-2.24)	58.59*	21.81*	17.48*
3	3.49 (3.36-3.62)	81.79*	32.81*	25.55*
0	Ref	Ref	Ref	Ref
Hospital location				
Rural	1.01 (0.95-1.07)	-13.06*	-1.55	-8.82*
Urban, non-teaching	0.93 (0.89-0.97)	-3.30$^{\Delta}$	-1.30	-1.26$^{\Delta}$
Urban teaching	Ref	Ref	Ref	Ref

* p<0.01, $^{\Delta}$ p<0.05, ± variables included in models but not displayed include race, household income, EGS diagnosis, EGS procedures, day of week of admission, hospital bed size, total number of discharges, hospital region, and hospital ownership. Ref: Reference

Results: We identified 434,186 TRAN and 14,513,806 DA patients. On univariate analysis, TRAN patients were more likely to have a higher Charlson comorbidity index, Medicare insurance, and a lower median household income compared to DA patients (p<0.0001). Mortality was significantly higher in the TRAN vs DA groups (4.5% vs 1.7%; p<0.0001). Morbidity (presence of any complication) was also higher among TRAN patients (41.8% vs 29.0%; p<0.0001). Morbidity among TRAN patients was primarily due to urinary- (15.4%), gastrointestinal- (14.7%), and pulmonary-related (14.0%) complications. Median LOS was 4.3 days for TRAN vs 3.0 days for DA (p<0.0001) patients. Median cost was higher for TRAN patients ($8,935 vs $7,167; p<0.0001). Regression analyses determined that TRAN patients after adjustment had significantly higher mortality, morbidity, and cost as well as longer length of stay. (Table)

Conclusions: Interhospital transfer of EGS patients is associated with increased mortality, morbidity, cost, and LOS. As the EGS population grows and ages while the EGS workforce declines, identifying risk factors of worse outcomes among transferred EGS patients can inform the design of specific performance improvement initiatives.

Poster # 106

ELEVATED BODY MASS INDEX AND ACUTE PULMONARY EMBOLISM FOLLOWING EMERGENCY GENERAL SURGERY: AN ACS-NSQIP DATABASE ANALYSIS

Maranda Pahlkotter MD, Jason D. Sciarretta* MD, Sharon Holmes MD, Keely Muertos MPH, John M. Davis* MD, University Of South Carolina/Grand Strand Medical Center

Introduction: Obesity represents a known risk factor for venous thromboembolism (VTE) following elective surgery and is well reported among surgical specialities. VTE pharmacologic agents at standard dosing can result in high VTE rates in these subset of patients. Following a review of the American College of Surgeons National Surgery Quality Initiative Program (ACS-NSQIP) database nearly a decade ago, a heightened awareness by surgeons demonstrated a reduction in VTE. The current efficacy of VTE prophylaxis in emergency general surgery is unknown. We hypothesize that increasing body mass index (BMI) observed in emergency general surgery (ES) is associated with increased risk of acute pulmonary embolism (PE) and death.

Methods: ACS-NSQIP database was queried (January 2015-December 2015) for all patients undergoing ES. The incidence of PE was reviewed for 5 BMI (kg/m^2) groups greater than $20kg/m^2$. Univariate comparisons was completed between normal weight (NW) (18.5-24.9kg/m^2), overweight (OW) (BMI 25-29.9 kg/m^2), obesity (O) (30-39.9 kg/m^2), morbidly obese (MO) (BMI 40-50kg/m^2), super obese (SO) (>50kg/m^2). Demographics, ES type, length of surgery, length of stay (LOS), ASA scoring, deep vein thrombosis (DVT), and mortality reviewed. All elective surgery cases and BMI < 18.5kg/m^2 were excluded.

Results: 36,565 patients identified undergoing ES at >800 participating ACS-NSQIP hospitals. Of those, 494 (1.3%) were diagnosed with a PE. Mean age was 65.9 ± 14.7 years, (range, 18-90+ years) 49.2% male, and a mean BMI of 29.5± 7.4 kg/m2 (range, 15.6-57.6 kg/m2). Population was predominately group O (30.6%). The presence of a PE was directly related to patient's BMI (p=0.015). When compared to NW, MO (p=0.010) and SO (p=0.023) groups were more likely to experience a PE following ES. Mean postoperative day of PE diagnosis was 11.2 ± 7.6 days, an ASA of 3.2 ± 0.8, and a mean operative time of 121.8 ± 72.6 min. Overall mean LOS was 17.6 ± 13.2 days. Patient groups O (p<0.001) and MO (p<0.001) had longer operative times compared to NW patients. Length of operation was found statistically significant. Perioperative PE following emergent appendectomy (p=0.005) and other abdominal surgery (p=0.004) were related to BMI in O and SO groups. 54 PE (10.9%) deaths (BMI 28.1 ± 8.6 kg/m2) occurred, 14 (25.9%) patients with concomitant DVT and PE. PE mortality was directly related to patient's BMI (p < 0.001), with SO group being 7 times more likely to expire from a PE after ES.

Conclusion: These findings suggest that an increasing BMI observed in ES amplifies the PE risk in these subset of patients. Surgeon education and strict perioperative VTE prophylaxis guideline adherence with ES can potentially decrease VTE events. Further prospective studies are needed to reiterate the improtance of a weight-based prophylactic dosing regimen for hospitalized obese emergency surgical patients. A multi-institutional, randomized controlled trial is necessary to conclusively determine if a strandardized weight-based prophylatic dosing regimen will improve the incidence of PE events.

	BMI < 20 (n= 32)	BMI 20 to 24.9 (n= 102)	BMI 25 to 29.9 (n= 147)	BMI 30 to 39.9 (n= 151)	BMI 40 to 49.9 (n=41)	BMI 50+ (n=6)	p-value
PE, n	32	102	147	151	41	6	-
DVT, *n* (%)	4 (12.5)	23 (22.5)	42 (28.6)	50 (33.1)	10 (24.4)	0 (0.0)	0.079
OR time, mean ± SD	100.6 ± 55.9	100.8 ± 44.4	119.0 ± 71.2	136.2 ± 89.7	132.8 ± 41.7	127.0 ± 51.1	**0.002**
Albumin, mean ± SD	2.8 ± 0.8	3.0 ± 0.8	3.3 ± 0.8	3.2 ± 0.8	3.3 ± 0.8	2.4 ± 0.3	**0.003**
LOS, mean ± SD	17.5 ± 11.7	17.6 ± 11.9	18.5 ± 15.3	17.8 ± 13.3	14.0 ± 6.9	10.0 ± 5.0	0.342
ASA, mean ± SD	3.6 ± 0.7	3.4 ± 0.8	3.0 ± 0.8	3.2 ± 0.8	3.4 ± 0.7	3.3 ± 0.5	0.506
Transfusion, *n* (%)	4 (12.5)	12 (11.8)	14 (9.5)	23 (15.2)	4 (9.8)	0 (0.0)	0.640
Died, *n* (%)	4 (12.5)	24 (23.5)	10 (6.8)	12 (7.9)	2 (4.9)	2 (33.3)	**< 0.001**
CPT Code: Surgical Procedure Location							
Abdomen, *n* (%)	2 (6.3)	7 (6.9)	7 (4.8)	15 (9.9)	9 (22.0)	2 (33.3)	**0.004**
Appendix, *n* (%)	0 (0.0)	4 (3.9)	16 (10.9)	14 (9.3)	0 (0.0)	2 (33.3)	**0.005**
Biliary Tract, *n* (%)	0 (0.0)	6 (5.9)	8 (5.4)	8 (5.3)	0 (0.0)	0 (0.0)	0.466
Esophagus, *n* (%)	0 (0.0)	2 (2.0)	4 (2.7)	0 (0.0)	0 (0.0)	0 (0.0)	0.317
Intestines, *n* (%)	26 (81.3)	72 (70.6)	102 (69.4)	96 (63.6)	26 (63.4)	2 (33.3)	0.155
Stomach, *n* (%)	2 (6.3)	8 (7.8)	8 (5.4)	12 (7.9)	4 (9.8)	0 (0.0)	0.877
*Other, *n* (%)	2 (6.3)	3 (2.9)	2 (1.4)	6 (4.0)	2 (4.9)	0 (0.0)	-

Poster # 107

RECURRING EMERGENCY GENERAL SURGERY: CHARACTERIZING A VULNERABLE POPULATION

Joseph V. Sakran MD,MPH, MPA, Nicole Lunardi MSPH, Ambar Mehta MPH, Joseph K. Canner MHS, Mohammad Hamidi MD, Faisal Jehan MD, Bellal A. Joseph* MD, Avery B. Nathens* MD,MPH,Ph.D., David T. Efron* MD, Johns Hopkins School of Medicine

Introduction: Limited data exists for long-term outcomes after emergency general surgeries (EGS) in the United States. The purpose of this study was to characterize the incidence of inpatient readmissions within 6-months and subsequent operations after an initial EGS procedure.

Methods: Adult patients (≥18 years old) undergoing one of seven common EGS procedures (appendectomies, cholecystectomies, small bowel resections, large bowel resections, control of GI ulcers and bleeding, peritoneal adhesiolysis, and exploratory laparotomies) were identified in the 2010-2015 National Readmissions Database. Patients who died during their index hospitalization were excluded. The rates of all-cause inpatient readmission and of undergoing a second EGS procedure within 6-months were calculated. Risk-factors of undergoing a second EGS procedure were identified using a multivariable logistic regression model. All analyses adjusted for patient factors, clinical factors and hospital clustering.

Results: There were 1,343,166 patients who underwent one of seven EGS procedures. Among patients with available postoperative data, 94,577 (14.9%) had an inpatient readmission within 6-months, occurring at a median of 41 days (IQR: 16-95 days). One-in-eight (16.3%) readmissions occurred at a different hospital than the index hospitalization. Among the 94,577 patients who had an inpatient readmission, 9,936 (10.5%) underwent a second EGS procedure, the most common of which included control of GI ulcer and hemorrhage (46.3%) and peritoneal adhesiolysis (18.7%) (Table). After adjustment, the following were associated with undergoing a second EGS procedure: number of comorbidities (adjusted odds ratio [aOR] 1.07 [95%-CI 1.06-1.09]), private center relative to a governmental hospital (aOR 1.11 [1.02-1.23]), discharge to home health care (aOR 1.30 [1.22-1.39]), and initial EGS procedures of control of GI ulcer and bleeding (aOR 16.8 [15.5-18.2]), laparotomy (aOR 11.6 [10.4-13.0]), and peritoneal adhesiolysis (aOR 6.8 [6.3-7.4]).

	Index EGS procedure	Second EGS procedure
	N=1,344,166	N=9936
Large bowel resections	5.0%	5.1%
Small bowel resections	3.6%	6.9%
Cholecystectomies	42.3%	9.4%
Control of GI ulcer/bleeding	10.6%	46.3%
Peritoneal adhesiolysis	9.1%	18.7%
Appendectomy	27.3%	4.8%
Laparotomy	2.1%	8.8%

Conclusion: Nearly 15% of patients undergoing an EGS procedure have an inpatient readmission within 6-months. One-in-ten readmitted patients underwent a second EGS procedure. As half of all second EGS procedures occurred within six weeks of the index procedure, carefully monitoring patients for at least two months postoperatively may help surgeons preemptively identify patients at risk for subsequent procedures.

Poster # 108

COMPARISON OF SCORING SYSTEMS (LRINEC, AAST IMAGING GRADE, FGSI) TO DIAGNOSE NECROTIZING SOFT TISSUE INFECTIONS (NSTI) AND THEIR ASSOCIATION WITH CLINICAL OUTCOMES

Tala F. Kana'an MBBS, Mohamed D. Ray-Zack MBBS, Matthew C. Hernandez MD, Pooja N. Reddy MS, Martin D. Zielinski* MD, Mayo Clinic - Rochester

Introduction: Efforts to improve management of NSTI depend on early diagnosis and characterization of its severity. This study aims to compare the diagnostic sensitivity of pre-operative scoring systems, including the Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC), the American Association for the Surgery of Trauma (AAST) imaging grade, and Fournier's Gangrene Severity Index (FGSI) and their ability to associate with key clinical outcomes.

Methods: A single institution review from 2004-2017 was performed. We included adult patients (≥18 years) with AAST operative grade (IV, V) disease severity. Baseline demographics, Charlson comorbidity index, and clinical outcomes (30-day mortality, intensive care admission (ICU), Clavien-Dindo ≥3 complication severity) were analyzed. Pairwise comparison of each scoring system was performed for selected outcomes and quantified using area under curve (AUC) with 95% confidence intervals (CI).

Results: In this study, 114 patients were diagnosed with NSTI with a mean age (±SD) of 57 (±14) years, 68% male. With respect to diagnostic sensitivity, AAST imaging grade was most accurate (67%) compared to FGSI (62%) and LRINEC (41%). In patients with NSTI, FGSI demonstrated improved accuracy compared to the AAST imaging grade to discern which patients required ICU admission (AUC 0.68 versus 0.52; p= 0.04) as well as 30-day mortality (0.74 vs 0.55; p= 0.03). All systems had comparable accuracy for other key outcomes studied and no significant differences using pairwise comparison, Table.

Conclusion: Pre-operative scoring systems provide valuable information to evaluate disease severity and outcomes. The AAST imaging grade was the most sensitive for NSTI diagnosis; however, FGSI was more accurate for ICU admission and 30-day mortality. All scoring systems demonstrated limited ability to associate with other outcomes in patients with NTSI.

Table

Outcome	FGSI	LRINEC	AAST Imaging	P value
Mortality	0.74 (0.65-0.82)	0.60 (0.50-0.69)	0.55 (0.45-0.64)	0.02
30-day readmission	0.52 (0.43-0.62)	0.59 (0.50-0.69)	0.64 (0.55-0.73)	0.25
ICU admission	0.68 (0.58-0.76)	0.64 (0.55-0.73)	0.52 (0.42-0.61)	0.03
Total number of operations	0.56 (0.47-0.66)	0.52 (0.43-0.62)	0.51 (0.41-0.60)	0.51
Clavien-Dindo ≥3	0.60 (0.51-0.69)	0.57 (0.47-0.66)	0.55 (0.46-0.65)	0.51
Extended duration of stay	0.50 (0.41-0.60)	0.52 (0.42-0.61)	0.58 (0.48-0.67)	0.46
Values reported using area under the curve (AUC) with 95% confidence intervals				

Poster # 109

ASSOCIATION BETWEEN EMERGENCY GENERAL SURGERY VOLUME AND OUTCOMES IN MILITARY HOSPITALS

Muhammad A. Chaudhary MD, Carlos J. Rodriguez DO,MBA, Nicki Kwon MS, Eric Goralnick MD, MS, Matthew J. Bradley MD, Peter Learn MD, Adil H. Haider* MD,MPH, Brigham And Women's Hospital

Introduction: Low Emergency General Surgery (EGS) hospital volume is associated with worse patient outcomes in the civilian setting. The military maintains treatment facilities in remote locations to provide healthcare access to service personnel and their families. Our objective was to determine if low volume military treatment facilities (MTF) are associated with worse EGS outcomes, compared to high volume MTFs.

Methods: Analysis of the TRICARE database from 2006 to 2014. TRICARE provides healthcare coverage to 9.5 million military personnel and families. Patients were identified using the AAST defined ICD-9 CM codes for EGS and ages 18-64 years. MTFs were divided into quartiles based on yearly volume. Outcomes of interest were 30-day mortality, complications and readmissions. Logistic regression models adjusted for age, sex, race, socio-economic status, geographic region, EGS condition category, surgical intervention and comorbid conditions were used to determine the effect of volume on outcomes.

Results: A total of 106,915 patients were treated for an EGS condition at 79 MTFs during the study period. The overall mortality rate was 0.21%, complication rate was 8.55% and readmissions rate was 4.45%. Highest volume quartile MTFs treated 61.1% of the patients while lowest volume quartile MTFs treated only 1.1%. In risk adjusted analysis lowest volume quartile MTFs were not associated with mortality (OR: 2.02, CI: 0.45-9.06) or readmissions (OR: 0.77, CI: 0.54-1.11), while they were associated with lower odds of complications (OR: 0.76, CI: 0.59-0.98), compared to the highest volume quartile.

Conclusion: EGS patients treated at low volume MTFs did not have worse patient outcomes when compared to high volume MTFs. Remote location MTFs provide adequate care to service personnel and their dependents for acute conditions and triage complex cases appropriately.

Volume Quartile	30-day Mortality	30-day Complications	30-day Readmissions
	OR* (CI)	OR* (CI)	OR* (CI)
1 (Highest)	Reference		
2	0.64 (0.44-0.94)	0.86 (0.82-0.91)	0.91 (0.84-0.98)
3	1.01 (0.62-1.65)	0.81 (0.75-0.88)	0.83 (0.74-0.92)
4 (Lowest)	2.02 (0.45-9.06)	0.76 (0.59-0.98)	0.77 (0.54-1.11)

OR= Odds Ratio, CI=Confidence Interval

**Adjusted for age, sex, race, geographic region, socio-economic status, EGS categories, Charlson comorbidity index and operative intervention*

Poster # 110

LAPAROSCOPIC VERSUS OPEN ADHESIOLYSIS FOR ADHESIVE SMALL BOWEL OBSTRUCTION: A 12-YEAR SINGLE CENTER RETROSPECTIVE STUDY

Jacopo Guerrini MD, Guido Costa MD, Laura Samà MD, Simona Mei MD, Martina Ceolin MD, Alan Biloslavo MD, Mauro Zago* MD, Daniela Zugna BS,Ph.D., Hayato Kurihara MD, Trauma And Acute Care Surgery - Humanitas Clinical And Research Center

Introduction: Laparoscopic adhesiolysis has become a widely accepted technique for treating adhesive small bowel obstruction (ASBO). Aim of this study is to evaluate its efficacy and safety.

Methods: Patients undergoing surgery for ASBO between 2005 and 2017 were included in this study, in presence of a preoperative CT scan and a confirmed intraoperative diagnosis of ASBO. The outcomes were postoperative length of stay (LOS), overall complication rate, operative time. In univariate analysis, Kaplan-Meier estimator and log-rank test were used to compare the outcomes of interest between patients treated laparoscopically vs. open surgery. A multivariable Cox regression model was carried out. CT scans of patients with ASBO caused by either surgically confirmed single band or matted adhesion were analyzed. CT findings were compared to develop a predictive model based on logistic regression to estimate the risk of ASBO caused by a single band adhesion. The predictive ability of the model was quantified by ROC curve.

Results: 116 patients were included in the study (males 53.5%, median age 68 ys). 68 patients (54.3%) were approached laparoscopically, with a conversion rate of 44%, which increased to 61.9% in case of matted adhesion ASBO, compared to 35.7% in single band ASBO (p=0.05). Two skilled surgeons preferred laparoscopic approach in 85% of cases, with an overall conversion rate of 30%, which decreased to 7% when considered only single band ASBO. LOS and operative time were significantly lower in laparoscopic group, without evident differences in terms of peritoneal tears, iatrogenic perforations and postoperative complications. Patients treated traditionally had a triplicated risk of being discharged later than those successfully treated laparoscopically (HR=3.43, 95% CI: 2.07-5.69). Intraoperative findings demonstrated single band ASBO in 65.5% of cases. By multivariable analysis, risk of single band ASBO was positively associated with two CT findings: presence of a complete obstruction (HR=4.14, 95% CI: 1.43-11.93) and “fat notch” sign (HR=7.40, 95% CI: 1.64-33.28). Using 0.5 as cut-point probability of single band for the predictive model, the sensibility was 85.5% and the specificity of 70.0%, the positive and negative predictive values were 84.4% and 71.8% respectively, the area the ROC curve was 0.86.

Concusion: Laparoscopic adhesiolysis is a safe and effective technique, associated with shorter LOS and characterized by lower conversion rate when performed by skilled surgeons for single band adhesion ASBO. Analysis of CT findings becomes extremely helpful by predicting whether ASBO is caused by single band or matted adhesion.

Poster # 111

THE IMPACT OF PRIOR LAPAROTOMY AND INTRA-ABDOMINAL ADHESIONS ON BOWEL AND MESENTERIC INJURY FOLLOWING BLUNT ABDOMINAL TRAUMA

Tyler J. Loftus MD, Megan L. Morrow MD, Lawrence Lottenberg* MD, Martin D. Rosenthal MD, Chasen A. Croft* MD, R. Stephen Smith* MD, Frederick A. Moore* MD, Scott C. Brakenridge* MD, MSCS, Philip A. Efron* MD, Alicia M. Mohr* MD, University of Florida - Gainesville

Introduction:Identifying patients with bowel and mesenteric injuries following blunt abdominal trauma is hindered by the suboptimal accuracy of initial physical exam and CT scan findings. We hypothesized that patients with intra-abdominal adhesions from prior laparotomy would be subjected to visceral sheering forces and increased risk for bowel and mesenteric injury following blunt abdominal trauma.

Methods:We performed a multicenter retrospective cohort analysis of 267 consecutive adult trauma patients who underwent operative exploration following moderate-critical (abdominal injury score 2-5) blunt abdominal trauma, comparing patients with prior laparotomy (n=31) to patients with no prior laparotomy (n=236). Multivariable regression was performed to identify predictors of bowel or mesenteric injury.

Results:There were no significant differences between groups for injury severity scores or preoperative CT scan findings. The prior laparotomy cohort had greater incidence of full thickness bowel injury (26% vs. 9%, p=0.010) and mesenteric injury (61% vs. 31%, p=0.001). Considering all patients with bowel or mesenteric injuries, the no prior laparotomy group had a greater proportion of injuries occurring at the ligament of Treitz or ileocecal region (52% vs. 25%, p=0.003). On multivariable regression, prior laparotomy was an independent predictor of bowel or mesenteric injury (OR 5.1, 95% CI 1.6-16.8) along with history of prior intra-abdominal inflammation and CT evidence of free fluid without solid organ injury (model AUC: 0.81, 95% CI 0.74-0.88).

Conclusion:Patients with a prior laparotomy are at increased risk for bowel and mesenteric injury following blunt abdominal trauma. The distribution of bowel and mesenteric injuries among patients with no prior laparotomy favors embryologic transition points tethering free intraperitoneal structures to the retroperitoneum.

Poster # 112

VARIABILITY IN MANAGEMENT OF BLUNT SPLENIC INJURY AT LEVEL 1 TRAUMA CENTERS

Elan Jeremitsky MD, Andrew R. Doben* MD, Ronald I. Gross* MD, Baystate Medical Center

Introduction: Nonoperative management (NOM) for blunt splenic injury (BSI) is common in the adult injured patient. Nationally, the incidence of splenectomy for BSI is around 20% and there is no standardized protocol for the management of BSI. There is a high discordance in the incidence of splenectomy (15-35%) regardless of grade at various institutions. Our hypothesis is that certain institutions more likely perform splenectomies than others without a concordant increase in the grade of BSI or overall injury severity score (ISS).

Methods: National Trauma Data Bank was evaluated for the years 2012-2014 with respect to BSI. Centers with more than 212 admissions for BSI were used for the study, which represented the upper tertile of all facilities. Facilities were then assigned to be either LOW or HIGH with respect to their overall splenectomy incidence by the median cut point of 21.3%. Univariant analysis was performed to evaluate for differences between these facilities.

Results: The incidence of splenectomy was 21.3% (3,941 with splenectomy out of 18,527 admissions with BSI). Splenectomy at LOW vs HIGH facilities is 15.4% vs 27.4%. ISS of LOW was significantly greater than HIGH, 23.8 ± 13.7 vs 22.7 ± 13.8 $p<0.001$. Mean age (39.7 ± 18.1 vs 39.9 ± 17.9 $p=0.41$) and the incidence of angiography (7.6% vs 7.9% $p=0.45$) were similar between the facilities. Table 1 demonstrates the incidence of splenectomy by grade.

Table 1: Grade of BSI at Time of Splenectomy Stratified by Facility

Grade of BSI	LOW FAC n=9,467	HIGH FAC n=9,060	p Value
1,2	4.2% n=3,930	7.8% n=3,605	
3	12.6% n=1,987	28.2% n=1,900	
4	32.6% n=1,338	56.4% n=1,275	<0.001
5	61.9% n=591	78.8% n=646	
NFS*	14.8% n=1,621	26.9% n=1,634	

*Uncharacterized BSI

Conclusion: There is a higher incidence of splenectomy, not driven by ISS or age, for BSI occurring in some institutions. The use of angiography and Grade of BSI does not explain the discrepancy of operative intervention between the two groups. There appears to be an institutional preference for performance of splenectomy for BSI. A national protocol for BSI is needed to determine the best practice or guideline of NOM for BSI.

Poster # 113

COLON AND SEVERE LIVER INJURIES PREDICT ABDOMINAL COMPLICATIONS AFTER DAMAGE CONTROL LAPAROTOMY FOR GUNSHOT WOUNDS

John F. Tierney MD, John C. Kubasiak MD, Devan J. Schlund MD, Charles Fredericks MD, Jennifer Poirier Ph.D., James Boron MD, Thomas Messer MD, Andrew Dennis DO, Frederic Starr MD, Kimberly Joseph* MD, Faran Bokhari* MD, Matt Kaminsky MD, Cook County Hospital

Introduction: Damage control laparotomy (DCL) has improved mortality in unstable trauma patients undergoing laparotomy, but an open abdomen is associated with considerable morbidity. Previous studies of open abdomen complications have been dominated by patients with blunt injuries. It is unclear whether these studies apply to patients who suffer penetrating trauma. We therefore examined if rates of open abdomen-associated complications differ by mechanism of injury, and identified risk factors for complications after DCL in patients who suffered gunshot wounds (GSW).

Methods: Patients who underwent DCL between May 2015 and December 2017 were identified from a prospectively-compiled trauma database. Demographics, initial physiologic parameters, injury patterns, and use of intraabdominal packing were noted. Severe liver injuries were defined as grade IV or V injuries or injuries that required arterial embolization. Variables of interest related to abdominal complications included: superficial wound infection, dehiscence, intraabdominal abscess, anastomotic leak, and enteric fistula. Our primary aim was to assess whether mechanism of injury is associated with the development of any of these complications. Our secondary aim was to assess rates of each type of abdominal complication as well as the need for re-exploration after fascial closure or for percutaneous drain placement, and intensive care unit (ICU) and hospital length of stay (LOS). Descriptive statistics, Fisher exact tests, Mann Whitney U tests, and Kruskal-Wallis tests were performed when appropriate.

Results: A total of 112 patients underwent DCL. Of those, 93 patients (83%) were male, with a median age of 29 ± 10 years. 91 patients (81%) sustained GSW. 59% of GSW patients (54 of 91) developed abdominal complications, compared to 29% of patients (6 of 21) injured by another mechanism ($p = 0.01$). Among GSW patients, the rate of abdominal complications was increased in patients with colon (OR: 2.92, $p = 0.02$) and severe liver injuries (OR: 3.09, $p = 0.03$). Patients with colon injuries were more likely to develop wound dehiscence (OR: 13.4, $p < 0.01$) and require re-exploration after fascial closure (OR: 7.34, $p = 0.01$). Patients with severe liver injuries were more likely to develop intraabdominal abscesses (OR: 3.01, $p = 0.03$) and require percutaneous drainage (OR: 3.75, $p = 0.01$), and those who underwent liver embolization were more likely to have a prolonged hospital LOS (median 35 days vs 21 days, $p = 0.04$).

Conclusions: GSW patients are more likely than other trauma patients to develop abdominal complications after damage control laparotomy. Among GSW patients, colon injuries and severe liver injuries are associated with an increased risk of abdominal complications after damage control laparotomy, despite adherence to antibiotic prophylaxis. Further investigation into optimal strategies to prevent these complications in high-risk patients is required.

Poster # 114

ANALYSIS OF OVER 2 DECADES OF COLON INJURIES IDENTIFIES OPTIMAL METHOD OF DIVERSION: DOES AN END JUSTIFY THE MEANS?

John P. Sharpe MD, MS, Nathan R. Manley MD,MPH, Mark S. Iltis MD, Richard H. Lewis MD, Timothy C. Fabian* MD, Martin A. Croce* MD, Louis J. Magnotti* MD, University of Tennessee Health Science Center - Memphis

Introduction: Conflicting evidence exists regarding the definitive management of destructive colon injuries. While some advocate resection plus anastomosis for the majority of patients, others employ the routine use of a diverting ostomy in select cases. In fact, although diversion with an end ostomy can theoretically decrease initial complications, it mandates a more extensive reversal procedure. Conversely, anastomosis with proximal loop ostomy diversion, while simplifying the reversal, increases the number of suture lines and potential initial morbidity. Nevertheless, for those purporting diversion, there is little data comparing end ostomy to anastomosis plus proximal diversion. Thus, the purpose of this study was to evaluate the impact of diversion technique on morbidity and mortality in patients with destructive colon injuries.

Methods: Consecutive patients with destructive colon injuries managed with diversion over a 21-year period were stratified by age, gender, severity of shock and injury, operative management, and timing of reversal. Deaths within 24 hours and patients with rectal injuries were excluded. Outcomes, including ostomy-related complications (obstruction, ischemia, readmission) and reversal-related complications (obstruction, abscess, suture line failure, fascial dehiscence), were compared between patients managed with a loop ostomy and those managed with an end ostomy.

Results: 115 patients were identified: 80 received an end ostomy and 35 received a loop ostomy. 47 patients required a planned ventral hernia (PVH). Ostomy-related complications occurred in 22 patients (19%) and 11 patients suffered reversal-related complications. 71 patients (62%) underwent ostomy reversal. There was no difference in ostomy-related (2.9% vs 3.8%, p=0.99) or reversal-related (0% vs 0%, p=0.99) mortality. For patients *without* a PVH, there was no difference in ostomy-related complications between patients managed with a loop ostomy and those with an end ostomy (12% vs 18%, p=0.72). However, patients managed with a loop ostomy had a shorter reversal operative time (112 vs 292 minutes, p<0.001) and reversal length of stay (6 vs 12 days, p=0.008) with fewer reversal-related complications (0% vs 36%, p=0.02). Use of a loop ostomy reduced hospital charges by $763,000. For patients *with* a PVH, there was no difference in ostomy-related complications, reversal operative time or length of stay, or reversal-related complications between patients managed with a loop ostomy and those with an end ostomy.

Conclusion: For patients with PVH, loop ostomy provided no additional benefit over end ostomy. However, for patients without PVH, loop ostomy reduced reversal-related complications, operative time, LOS, and hospital charges without compromising initial morbidity. Thus, for all patients, loop ostomy should be the preferred method of diversion, if required, following destructive colon injury.

Poster # 115

Serial Hemoglobin Monitoring in Adult Patients with Blunt Solid Organ Injury: Less is More

Dustin Price DO, Marie Crandall* MD, David Skarupa* MD, Brian Yorkgitis DO, David Ebler MD, Albert Hsu MD, Andrew Kerwin* MD, Firas Madbak* MD, University of Florida, Jacksonville

Introduction: Patients who sustain blunt solid organ injury to the liver, spleen or kidney and are treated nonoperatively frequently undergo serial monitoring of their hemoglobin (Hgb) at set intervals as often as every four to six hours. We hypothesized that in hemodynamically stable patients with blunt splenic, hepatic or renal injuries treated without an operation, scheduled monitoring of serum hemoglobin values may be unnecessary as hemodynamic instability, not merely hemoglobin drop, would prompt intervention.

Methods:We performed a retrospective review of adult patients admitted to our urban Level 1 trauma center following blunt trauma with any grade liver, spleen or kidney injury from January 1, 2016 to December 31, 2016. Patients who were hemodynamically unstable and went directly to the operating room were excluded. Patients who required any urgent or unplanned operative or angiographic intervention were compared with patients who did not require an intervention. Routine demographic and outcome variables were obtained and bivariate and multivariate regression statistics were performed using Stata v10.

Results: A total of 141 patients were admitted with blunt hepatic, splenic, renal or combined injuries. Age distribution did not differ significantly between the two groups (39.3 vs 41.4 years, p-value=0.51). Patients who underwent an intervention, in general had a higher Injury Severity Score (ISS) (26.7 vs 22.1; p-value=0.12) and lower admission Hgb (11.9 vs 12.8 g/dL; p-value=0.06). The number of Hgb draws (9.2 vs 10; p-value=0.69) and the associated change in Hgb (3.7 vs 3.5; p-value=0.71) did not differ significantly between the two groups. Number of RBC units transfused was higher in the intervention group (3 vs 1; p-value=0.09). No patients in the non-operative group required operative intervention based on decreasing Hgb. All of the 21 patients who required laparotomy underwent surgery within 4 hours after admission.

Conclusion: Among patients with blunt solid organ injury, a need for emergent intervention in the form of laparotomy or angioembolization typically occurs within the first hours of injury. Routine scheduled hemoglobin monitoring did not alter management and is unnecessary in the management of blunt solid organ injury.

Poster # 116

SPLENIC ARTERY ANGIOEMBOLIZATION FOR HIGH-GRADE SPLENIC INJURY: STOP WASTING TIME AND MONEY

Lara Senekjian MD, MS, Bryce Robinson* MD, Joseph Cuschieri* MD, Harborview Medical Center

Introduction: Practice management guidelines advocate for non-operative management (NOM) of hemodynamically normal patients sustaining blunt splenic injuries of all grades. Splenic artery embolization (SAE) has been advocated to improve rate of splenic salvage in the setting of NOM. The purpose of this study is to determine the cost-effectiveness of SAE for high-grade splenic injuries, grade III-V.

Methods: Using TreeAge software, a cost-utility analysis was developed for a 40-year-old male base-case patient with blunt splenic injury. We compared non-operative management to non-operative management with SAE. Non-operative patients were modeled with the probability of failure requiring splenectomy, readmission, and post procedure complications. Patients managed by SAE were modeled with probability of failure leading to splenectomy, readmission, and post interventional radiology (IR) complications. Probabilistic sensitivity analysis was completed by Monte Carlo simulation with 10,000 random walks to account for variable and model uncertainties. Each high-grade injury splenic injury (III-V) was evaluated separately. Probabilities of procedural complications, readmissions requiring additional management, and splenectomy rates were extracted from published data between 2000-2017. Costs were collected from Centers for Medicare and Medicaid Services Healthcare Cost and Utilization Project and expressed in 2014 dollars. Utility outcome was quality-adjusted life years (QALY).

Results: For patients with grade III blunt splenic injury, NOM was $32,279 with gain of 0.96 QALY compared to SAE that costs $70,197 with gain of 0.89 QALYs, thus NOM is the dominant strategy. For patients with grade IV injury, NOM costs $44,192 with 0.87 QALYs gained compared to SAE that costs $70,113 with 0.89 QALYs gained. This results in an interval cost effectiveness ratio (ICER) of NOM to SAE of $1,296,046/QALY. For patients with grade V injury, NOM costs $56,959 with 0.78 QALYs gained compared to SAE that costs $68,141 with 0.91 QALYs gained. The ICER comparing NOM to SAE is $86,015/QALY. Using the standard willingness-to-pay threshold of $50,000, NOM is the more cost-effective strategy for grade IV and V injury. In grade III injury, NOM is the dominant treatment strategy.

Conclusion: For grade III injuries, NOM without SAE results in the most cost-effective strategy yielding more quality-adjusted life years. NOM without SAE is the most cost-effective strategy for all high-grade splenic injuries. Thus, non-operative management of splenic injuries should routinely be performed without SAE.

Poster # 117

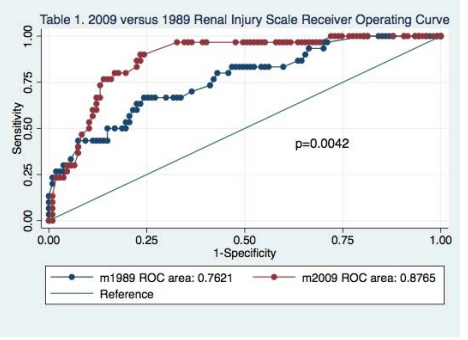
EVALUATING THE 2009 REVISION OF THE 1989 AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA RENAL INJURY SCALE: CAN WE IMPROVE?

Eric Ballon-Landa MD,MPH, Omer Raheem MD, Leslie Kobayashi* MD, Jill Buckley MD, UC San Diego

Introduction:
To better characterize traumatic renal injury a revision to the 1989 American Association for the Surgery of Trauma (AAST) Renal Injury Scale (RIS) has previously been proposed. The key changes proposed were: grade IV includes collecting system and segmental vein or artery injuries, and grade V omits the construct "shattered kidney" in favor of main renal hilum vascular injury or complete ureteropelvic junction disruption. We sought to validate the 2009 AAST-RIS, emphasizing grade reclassifications between the 1989 and 2009 AAST scales and subsequent management.

Methods:
Using a prospective trauma database, patient demographics and renal injury characteristics, computerized tomography imaging, radiology reports, and subsequent management were recorded. Descriptive analyses were performed with original grade, revised grade, and radiology reports; further analysis of major interventions was performed for severe injuries. Two multivariate logistic regression models for intervention were tested using 1989 and 2009 grades. We compared the models to evaluate which grading scale better accounted for the study data.

Results:
Among 256 cases of renal injury from 2004-2016, 42 (21.9%) were reclassified using the revised 2009 scale; 50 cases (19.5%) were upgraded, 6 (2.3%) were downgraded, and 200 (78.1%) were unchanged. Among cases with grades III or higher, 131 (81.4%) were managed non-operatively, 9 (5.6%) with angioembolization, 9 (5.6%) with nephrectomy, and 12 (7.5%) with renorrhaphy; management was significantly associated with original and revised grade (X^2, p=0.02 and p<0.001, respectively). These associations were preserved when correcting for covariates; further, the multivariate model using the 2009 grades significantly outperformed the 1989 model (Table 1).



Conclusion:
Employing the 2009 revision to the AAST-RIS led to more definitive classification of renal injury and a stronger association with renal trauma management. Applying the revised AAST criteria, which define renal trauma injuries with more clarity, may facilitate and improve the multidisciplinary care of renal trauma by urologists, trauma surgeons, and radiologists.

Poster # 118

OPTIMAL TIMING OF DELAYED EXCRETORY PHASE CT SCAN FOR DIAGNOSIS OF URINARY EXTRAVASATION AFTER HIGH-GRADE RENAL TRAUMA

Sorena Keihani MD, Gregory J. Stoddard MPH, Douglas M. Rogers MD, Bryn E. Putbrese MD, Kaushik Mukherjee* MD, Sarah Majercik* MD, Christopher M. Dodgion* MD,MPH, Scott A. Zakaluzny* MD, Brian P. Smith* MD, Reza Askari* MD, Matthew M. Carrick* MD, Jurek F. Kocik* MD, Marta E. Heilbrun MD, Raminder Nirula* MD,MPH, Jeremy B. Myers MD,
University of Utah

Introduction: Delayed excretory phase CT scan is often needed to evaluate potential collecting system injuries and accurately grade renal injuries after high-grade renal trauma (HGRT). Excretory phase with adequate contrast accumulation into the collecting system allows to evaluate for urinary extravasation. However, the optimal timing to obtain the excretory phase after renal trauma is not established. We aimed to assess the association between excretory phase timing and diagnosis of urinary extravasation and also suggest a cut-off point based on multi-institutional data on HGRT.

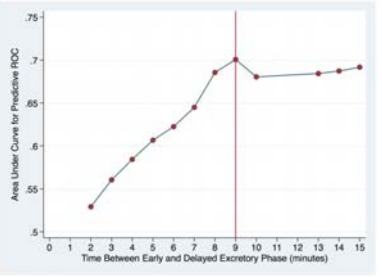
Methods: From 2014-2017, clinical and imaging data on HGRT (AAST grades III-V) were gathered from 14 Level-1 trauma centers participating in the AAST Genito-Urinary Trauma Study. Patients with missing initial CT scans or those who underwent immediate surgery without imaging were excluded. Initial and follow-up CT scans were reviewed by two radiologists to extract injury details including vascular contrast extravasation, as well as urinary extravasation. The time between early (portal venous) and excretory phases was recorded. Hypotension was defined as systolic blood pressure <90 mmHg. Kruskal-Wallis and Wilcoxon ranked-sum test with Hommel's correction for multiple comparisons were used to compare excretory phase time in different urinary extravasation diagnosis groups (Yes/No/Inconclusive). Logistic regression was used to measure the association between excretory phase timing (continuous) with diagnosis of urinary extravasation (binary outcome). Predictive receiver operating characteristic (PROC) analysis, using positive and negative predictive values (PPV and NPV) and the area under curves (AUC) were used to suggest a cut-off point optimizing detection of urinary extravasation when present.

Results: A total of 326 patients met the inclusion criteria. Of these, 243 (74%) had excretory phase CT scans for review either initially (210) or at their follow-up (33). At initial CT with excretory phase, 46 patients (22%) were diagnosed with urinary extravasation and 25 patients (12%) had inconclusive images. Median time between portal venous and excretory phases was 4 minutes (IQR: 4 –7 minutes). Time of initial excretory phase was significantly higher in those diagnosed with urinary extravasation (median: 7 minutes, IQR: 4–10) vs. those not diagnosed with urinary extravasation (median: 4 minutes, IQR: 4–6) and those with initial inconclusive images (median: 4 minutes, IQR: 4–5) [P <0.001 and 0.03, respectively]. In multivariable logistic regression, increased time to excretory phase was positively associated with finding urinary extravasation at the initial CT scan, after controlling for injury severity score, trauma mechanism, hypotension, and renal vascular contrast extravasation (Odds Ratio per minute: 1.26, 95% CI: 1.14-1.40, P<0.001). The optimal cut-off for detecting urinary extravasation in our study was 9 minutes (PPV: 56%, NPV: 84%; PROC AUC: 70%).

Conclusion: The timing of excretory phase imaging is important in diagnosis of urinary extravasation after HGRT. In our study, most excretory phases were timed about 4 minutes after the early contrast phase. We suggest a 9-minute delay between the early and excretory phases to optimize diagnosis of collecting system injuries.

Time between early and excretory phase	PPV (%)	NPV (%)	PROC AUC	% of urinary extravasation detected at time-point [c]
3 minutes	23.2	100	0.616	7.4% (2/27)
4 minutes	25.7	93.9	0.598	15% (11/73)
5 minutes	34.0	87.7	0.609	21% (5/24)
6 minutes	38.6	86.2	0.624	20% (3/15)
7 minutes	43.6	85.5	0.646	23% (4/17)
8 minutes	52.6	84.6	0.686	33% (2/6)
9 minutes [a]	56.3	83.9	0.701	62% (5/8)
10 minutes [b]	54.2	81.8	0.680	50% (4/8)
13 minutes [b]	56.3	80.4	0.683	50% (1/2)
14 minutes	57.1	80.1	0.686	50% (1/2)
15 minutes	58.3	79.8	0.691	58% (7/12)

PPV, positive predictive value; NPV, negative predictive value; PROC, predictive receiver operating characteristic; AUC, area under curve
[a] Suggested time cut-point based on highest PROC AUC and increase in % of urinary extravasation diagnosed at the time point.
[b] No data available for minutes 11 and 12; PPV, NPV, and PROC AUC the same as minute 13
[c] Data on this column is based on specific time points with presented sample sizes; other columns use all the data dichotomized at specific cut-points.



Poster # 119

CURRENT MANAGEMENT OF EXTRAPERITONEAL TRAUMATIC BLADDER INJURIES: RESULTS FROM THE AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA (AAST) GENITOURINARY TRAUMA STUDY

Rachel A. Moses MD,MPH, Sorena Keihani MD, Sarah Majercik* MD, Frank N. Burks MD, Sean P. Elliott MD, Kaushik Mukherjee* MD, Bradley A. Erickson MD, Richard A. Santucci MD, Brian P. Smith* MD, Christopher M. Dodgion* MD,MPH, Scott A. Zakaluzny* MD, Benjamin N. Breyer MD, James M. Hotaling MD, Raminder Nirula* MD,MPH, Jeremy B. Myers MD,
University of Utah

Introduction: Bladder trauma is an uncommon urologic injury; research on extraperitoneal bladder injuries (EBI) is mostly limited to retrospective, single-institutional studies. Our goal is to understand current management trends and the role of surgical repair for EBI in a large contemporary multi-institutional setting.

Methods: From 2014 to 2017, data on bladder injuries were collected from 12 participating Level-1 trauma centers. Demographics, injury characteristics, acute management, complications, and need for delayed interventions were noted. Patients were excluded if they died during the first 48 hours after arrival due to non-urologic injuries. Descriptive statistics were used to report management patterns of EBI during this period.

Results: 82/160 (51%) bladder injuries were EBI. Patient and injury characteristics are summarized in Table-1. Most injuries (79%) were blunt and 87% had concomitant injuries. 65 patients (79%) had pelvic fracture, 31 (48%) of whom underwent open reduction and internal fixation (ORIF). EBI was repaired in 34 (41%) patients at a median of 8 hours (IQR 2-23 hours) from admission. The three leading reasons for EBI repair were: severity of the injury or bladder neck injury (38%), injury found during laparotomy (38%), and concerns about pelvic hardware contamination (35%). Complications in the non-operative group included UTI/sepsis (6), pelvic hardware infection and removal (3), and persistent urine leak (3). Three patients with persistent leak eventually underwent bladder repair, 2 of whom had intravesical bone fragments. Complications in the operative group included vesicocutaneous fistula and pelvic osteomyelitis (2), UTI/sepsis (2), persistent urine leak (2), and pelvic abscess (1). In patients undergoing ORIF, rates of complications or hardware infection were not different between conservative and operative bladder management groups.

Conclusion: A large proportion of EBI are currently operatively managed and role of surgery should be considered in evaluation of EBI. Both conservative and operative management of EBI is associated with high rates of complications, however, there may be significant selection bias for operative management of severe injuries, which hampers interpretation of similar complication rates.

Table-1 Demographics and management of extraperitoneal traumatic bladder injuries

	Total (N=82)	Conservative (N=48)	Surgical Repair (N=34)	P-value *
Age, mean (SD), y	42.8 (18.2)	45.7 (19.5)	38.7 (15.6)	0.09
Male sex, No. (%)	58 (71%)	30 (62%)	28 (82%)	0.05
Type of injury				**0.001**
Blunt	65 (79%)	44 (92%)	21 (62%)	
Penetrating	17 (21%)	4 (8%)	13 (38%)	
ISS, mean (SD)	26.5 (14.1)	29.0 (14.6)	23.0 (12.7)	0.06
Concomitant injuries, No. (%) [1]	72 (87%)	45 (93%)	27 (79%)	0.05
Pelvic fracture	65 (79%)	42 (87%)	23 (68%)	**0.03**
Bladder neck injury	7 (8%)	1 (2%)	6 (18%)	**0.02**
Rectal injury	12 (15%)	4 (8%)	8 (23%)	0.05
Non-urologic operation				
Exploratory laparotomy	32 (39%)	9 (19%)	23 (68%)	**<0.001**
ORIF	31 (38%)	15 (36%)	16 (47%)	0.15
Length of stay, mean (SD), d	15.1 (14.7)	15.5 (14.6)	14.4 (15.1)	0.73
Complications, No (%)	19 (23%)	12 (25%)	7 (21%)	0.83

SD, standard deviation; ISS, injury severity score; ORIF, open reduction and internal fixation
[1] Defined as presence of any concomitant injury, including: solid organ, gastrointestinal, spinal cord, major vascular, and pelvic fracture.
* comparisons made between conservative and surgical repair management groups

Poster # 120

BLAME IT ON THE TRAUMA: INURY IS AN INDEPENDENT RISK FACTOR FOR PANCREATIC FISTULA FOLLOWING DISTAL PANCREATECTOMY COMPARED TO ELECTIVE RESECTION

Noah S. Rozich MD, Katherine T. Morris MD, Tabitha X. Garwe MPH,Ph.D., Zoona Sarwar MPH, Alessandra Landmann MD, Chesney Burgweger BS, Alexandra Jones BS, Casey S. Butler MD, Paul K. McGaha II, MD, Benjamin Axtman MD, Barish H. Edil MD, Jason S. Lees* MD, University Of Oklahoma

Introduction: Postoperative pancreatic fistula (POPF) remains a significant source of morbidity following distal pancreatectomy (DP), both for elective resection and following traumatic injury. There exists a lack of information regarding the impact of trauma on POPF rates when compared to elective resection. We hypothesize that trauma would be a significant risk factor for the development of POPF following DP.

Methods: All patients undergoing DP from 2000-2017 at a single-institution were retrospectively reviewed. Patients undergoing resection for trauma were compared to those undergoing elective resections for benign disease. This was done to attempt to control for pancreatic parenchymal texture, as patients with benign diagnoses and trauma are more likely to have similar gland texture compared to patients with malignant disease. However, fistula rates between all elective cases (benign and malignant) were compared to rates among trauma patients separately. Univariate and multivariable analyses were performed using SAS (version 9.4). The updated version of International Study Group for Pancreatic Fistula (ISGPF) definition of POPF was used to define a pancreatic fistula. P-values of <0.05 were considered statistically significant.

Results: Of the 203 patients who underwent DP from 2000-2017, 43 (21.2%) were due to trauma, 65 (32%) were due to benign diagnoses, and 95 (46.8%) were for malignant diagnoses. Six patients did not survive for 72 hours and were excluded from the analysis. When comparing trauma patients to patients undergoing resection for benign diagnoses, there were significant differences between groups in mean age (29.8 vs 51.6 years, $p<0.0001$), gender (71.1% male vs 41.5% male, $p=0.0008$), Body Mass Index (low/normal: 55.6% vs 16.1%, overweight: 25% vs 28.6%, Obese: 19.4 vs 55.4, $p=0.0001$), smoking status (73.7% current smokers vs 17.3%, $p<0.0001$), and the number of patients with comorbid conditions (7.9% vs 55.4%, $p<0.0001$). While significantly more trauma patients had stapled closure of their pancreas (62.2% vs 30.8%, $p=0.0020$) compared to benign-elective cases, on univariate analysis, there was no significant effect seen on the rate of developing a POPF (OR: 1.10, 95% CI: 0.47-2.56, $p=0.8257$). On multivariable analysis, after controlling for age, gender, postoperative transfusion rate, BMI, and tobacco use, the odds of developing a POPF in trauma patients were 11 times those of benign-elective patients (OR: 10.67, 95% CI: 1.31-86.92, $p=0.0270$).

Conclusion: To our knowledge, this study represents the largest cohort of patients comparing pancreatic leak rates in traumatic vs elective DP, and demonstrates that traumatic injury is an independent risk factor for developing an ISGPF grade B or C pancreatic fistula following DP. Adjusting surgical management, such as the practice of leaving intraperitoneal drains after DP, should be considered to account for this prominent risk factor.

Poster # 121

DESIGNING A NOVEL METHOD FOR COLLECTING PATIENT-REPORTED OUTCOMES IN THE TRAUMA POPULATION: UNDERSTANDING IMPLEMENTATION CHALLENGES

Graeme M. Rosenberg MD, Emily J. Shearer MPP, MSc, David A. Spain* MD, Thomas G. Weiser* MD,MPH, Stanford University

Introduction: Monitoring longitudinal patient-reported outcomes (PROs) and quality of life after injury is the next frontier of comprehensive trauma care. Current methodologies for monitoring outcomes are resource intensive with variable rates of engagement. We aimed to explore the feasibility of using a secure, internet-based survey platform to improve collection of PROs after injury.

Methods: English-speaking patients ≥ 18 years-old admitted to a Level I University Trauma Center with traumatic injuries were prospectively enrolled over three months. The following injury criteria were used for eligibility: emergency operation; or ICUlength-of-stay greater than two midnights; or hospital length-of-stay greater than 4 days. A GCS of 15 was required for consent. Surveys were administered using an automated electronic survey platform taken on a tablet device provided at the time of enrollment. The survey platform utilized customized questionnaires to collect demographic details and user experience data. NIH-PROMIS tools relating to health-related quality of life, patient-reported mental health, efficacy of symptom management, and social functioning were administered via the survey platform which enables use of available computer adaptive tests. Follow-up surveys were automated to be released by the survey platform via email at 3 months with a 2-week window for completion; nonresponse generated an automatic reminder email. During enrollment, contextual field notes were recorded by research staff including information related to interruptions in care, barrier to enrollment and completion of the surveys, and challenges faced by the participants.

Results: During the 3-month pilot study, forty-seven patients were eligible for enrollment; 26 (55%) enrolled and 19 (40%) patients completed surveys. Technical constraints and declined participation were the primary barriers to enrollment (Figure 1). Twelve (26%) eligible patients could not participate either because they did not use email or had insurmountable difficulties using the tablet device. Of the 26 patients who were enrolled, 7 requested email links so they could begin the survey after discharge – none initiated the survey. Contextual field notes revealed three major obstacles to completing the survey: competing hospital tasks, issues with technology, and declining participation. Participation in this voluntary survey study was often lowest priority in the context of symptom management, team rounding, and disposition planning. Casts, splints, slings, and symptoms such as fatigue and nausea hindered use of the tablet. Some mild TBI and elderly patients struggled with the electronic interface and touchscreen. Young male trauma patients were most likely to decline participation and frequently believed they would not face issues while recovering. The final group of participants included 14 (74%) men and 5 (26%) women with an average age of 55 years (SD 19). The majority (89%) of injuries were blunt force mechanisms. For those who did complete the survey, the average completion time was 43 minutes – only 21% found this too long. Seventy-four percent of participants reported the system easy to use, 26% had “slight” issues and 0% had “major” issues with the system. Ninety-five percent of patients anticipated they would “very likely” or “definitely” respond to future surveys.

Conclusion: Patient engagement was the greatest barrier with lack of email access and technological issues contributing to over half of the reasons for not enrolling. Advancing age, foreign-language, and lower socioeconomic status is associated with reduced access to personal computers, handheld devices, and internet services in the US. These population characteristics are over-represented in the trauma population. Electronic capture of longitudinal PROs, while convenient, must consider socioeconomic barriers to its use.

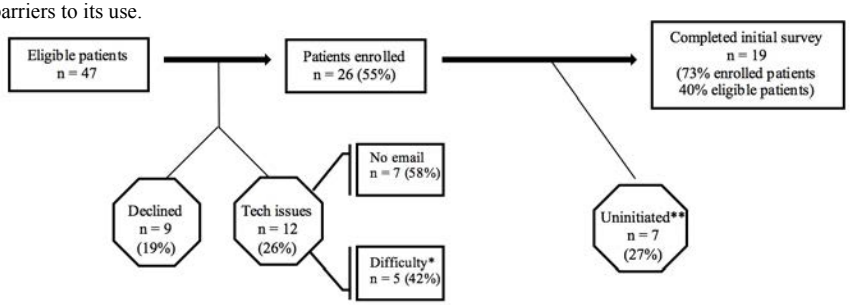


*Figure 1: Dropout of eligible patients during the three-month feasibility study. *Unable to hold, read, or manipulate tablet device. **Patient requested emailed survey to initiate after impending discharge (0/7 initiated survey).*

Poster # 122

MEASURING PRE-INJURY FUNCTIONAL STATUS, WHICH INSTRUMENT?

Kevin M. Schuster* MD,MPH, Ian Schlieder DO, Yawei Zhang MD,MPH,Ph.D., Robert Becher MD, MS, Adrian A. Maung* MD, Kimberly A. Davis* MBA,MD, Yale School of Medicine

Introduction: Functional outcomes in the elderly after injury are as important as commonly reported morbidity and mortality. Long term functional outcome depends on pre-injury function in the aged. Measuring pre-injury functional status in the critically injured may be difficult as it requires recollection of premorbid functional status, or by report of a surrogate. Although multiple instruments are available for measuring functional status, it is unknown which, if any, will perform well when used by a surrogate. We assessed six commonly available instruments.

Methods: Elderly (>=65), minimally injured trauma patients or uncomplicated elective colorectal surgery patients, with a normal mental status, and had a surrogate who either provided care for or resided with the patient were enrolled within 48 hours of admission. Patient and surrogate pairs completed identical instruments and were instructed to complete the instruments considering the patient's pre-injury or pre-operative functioning. Correlation was assessed with Pearson correlation coefficients. Linear regression assessed factors potentially associated with degree of correlation.

Results: One hundred eighteen patient-surrogate pairs were enrolled with a mean age of 78.5 ± 8.4, 68 (60.0%) were female, 110 (93.2%) were trauma patients. Surrogates were spouses (50.0%), children (42.4%), siblings (3.4%) or other (4.2%). Concordance was excellent for the Glasgow Outcome Scale, Katz's Index and the Barthel index (Table). Physical functioning, activities of daily living (ADL) and instrumental activities of daily living (I-ADL) had better surrogate correlation than measures of mental health and social interaction. Katz's index correlation was lower for siblings or children vs. a spouse (p=0.017, 0.001 respectively).

Instrument	Patient Score (Mean ± SD)	Surrogate Score (Mean ± SD)	p-value	Pearson coefficient
Glasgow Outcome Scale - Extended	5.49 ± 2.04	5.39 ± 2.00	0.78	0.9422
SF-36				
Physical Functioning	47.03 ± 36.71	43.64 ± 37.97	0.62	0.9269
Role-physical	61.02 ± 42.95	65.54 ± 45.05	0.58	0.7689
Bodily Pain	69.03 ± 25.27	69.42 ± 21.45	0.93	0.8600
General Health	56.81 ± 16.44	55.53 ± 13.65	0.64	0.7401
Vitality	54.75 ± 14.03	55.08 ± 11.35	0.89	0.6739
Social Functioning	70.55 ± 24.87	75.00 ± 20.76	0.29	0.7253
Role-emotional	87.01 ± 28.38	90.40 ± 25.56	0.50	0.4853
Mental Health	67.05 ± 13.94	68.75 ± 12.08	0.48	0.8003
Reported Health Transition	49.58 ± 21.01	51.69 ± 17.29	0.55	0.6546
CSHA Clinical Frailty Index	0.039 ± 0.029	0.035 ± 0.028	0.46	0.9171
Katz Index of Independence in ADL	4.81 ± 1.69	4.90 ± 1.60	0.78	0.9612
Functional Status Questionnaire				
Basic ADL	79.85 ± 20.99	78.16 ± 20.83	0.66	0.9328
Intermediate ADL	55.69 ± 31.17	53.76 ± 31.57	0.74	0.9604
Mental Health	71.59 ± 14.59	76.34 ± 10.25	0.043	0.3738
Work Performance	53.39 ± 9.46	52.26 ± 6.70	0.46	0.6838
Social Activity	78.53 ± 27.11	79.00 ± 28.35	0.93	0.9163
Quality of Social Interaction	75.12 ± 15.33	76.95 ± 12.87	0.48	0.1511
Barthel Activities of Daily Living	17.64 ± 3.23	17.88 ± 2.81	0.67	0.9559

Conclusion: Pre-injury physical functioning and ADL/I-ADL can be accurately assessed through a surrogate with an excellent degree of agreement. Measures of psychosocial functioning are good; however, the lower degree of concordance likely limits their use for comparing pre- and post-injury change in the mental, emotional and social domains. Katz's index performs less well when the surrogate is not the patient's spouse.

Poster # 123

RISK FACTORS ASSOCIATED WITH POOR LONG-TERM SOCIAL FUNCTIONING AFTER TRAUMA

Rachel Rivero BS, Juan Herrera Escobar* MD, Michel Apoj BS, Alexandra Geada BS, MBS, Matthew Villanyi BS, Deepika Nehra MD, George Velmahos MD,Ph.D., Haytham Kaafarani MD,MPH, Ali Salim MD, Adil Haider* MD,MPH, George Kasotakis* MD,MPH, Boston University Medical Center

Introduction: Social Functioning (SocFun), the ability to participate in organized or informal family, friend or peer groups and communal activities, is intertwined with physical and emotional health. As trauma can have a lasting effect on both physical and emotional well-being, it may also prevent injury victims from returning to their baseline SocFun norms, although little is known about these complex interactions. With this project we aim to determine risk factors associated with long-term Social Dysfunction (SocDys) after trauma.

Methods: Adults with an Injury Severity Score >9 managed at three urban academic Level I trauma centers were contacted at 6 and 12 months after injury. Phone interviews were conducted to inquire about SocDys (whether patient's physical and emotional health has interfered with their social activities, such as visiting friends and interacting with family members). Demographics, socioeconomic parameters, mechanism and severity of injury, as well as hospital course information were also obtained. Data were compared between patients who reported SocDys and those who did not. A stepwise backward logistic regression model for SocDys, adjusting for the parameters that were different between the two groups was fitted.

Results: Of the 632 screened patients, 48.1% reported SocDys. Differences in demographics, socioeconomic parameters, injury characteristics and hospital course are summarized in the table. High school (or lower) education, longer hospital stays, and African American (AA) race independently increased risk for SocDys. AA patients were more likely to be younger ($p<0.001$), Medicaid beneficiaries ($p<0.001$), penetrating injury victims ($p<0.001$), have lower education ($p<0.001$), and be discharged home ($p=0.02$).

Conclusion: Lower educational attainment, lengthy hospital stays and AA race appear to predispose to SocDys after trauma. This information should alert clinicians and caretakers of this potential long-term adverse social outcome.

	SocDys (n=304)	No SocDys (n=328)	p-value	SocDys Independent Risk Factors [Odds Ratio (95% C.I.)]
High school education	181 (61%)	117 (39%)	<0.001	2.43 (1.75-3.38)
Length of stay (days, IQR)	5 (3-9)	4 (3-6)	<0.001	1.04 (1.01-1.07)
African American race	67 (65%)	36 (35%)	<0.001	1.71 (1.08-2.72)
Medicaid Insurance	49 (64%)	27 (36%)	0.002	Not Sig
Mech. Ventilation	48 (65%)	26 (35%)	0.002	Not Sig
Age (years)	53±20.8	57±20.5	0.016	Not Sig

Poster # 124

POST- INJURY COMPLICATIONS- AN ANALYSIS OF CAUSATIVE FACTORS: WHERE DID WE ERR?

Elizabeth Warnack MD, Beatrix Choi H. Leon Pachter* MD, Charles DiMaggio Ph.D., Spiros Frangos* MD,MPH, Michael Klein MD, Marko Bukur* MD, New York University Langone Medical Center

Introduction: Injury care involves the complex interaction of patient, physician, and environment that impacts patient complications, level of harm, and failure to rescue (FTR). FTR represents the likelihood of a hospital to "rescue" patients from death after in-hospital complications. We hypothesize that error type and number of errors contribute to increased level of harm and failure to rescue.

Methods: Patient information was abstracted from weekly Trauma Performance Improvement (PI) (1/1/16 -7/19/17), where trauma surgeons determined level of harm and identified factors associated with complications. Level of harm was determined by definitions set forth by the Agency for Healthcare Research and Quality (AHRQ). Logistic regression was used to determine the impact of individual factors on FTR and level of harm, controlling for age, gender, Charlson score, ISS, error (in diagnosis, technique, or judgment), delay (in diagnosis or intervention), and need for operation.

Results: 2,216 trauma patients presented during the study period. 224 (10.1%) had complications reported at PI; of these, 31 patients (13.8%) had FTR. PI patients were more likely to be older (median 51.8 vs 44.9 years, $p = .002$) and have higher ISS (median 22 vs 8, $p < .01$). Physician-attributable errors (OR 2.59, $p < .01$), most commonly errors in technique, and nature of injury (OR 1.97, $p < .05$), were associated with higher levels of harm, while delays in diagnosis or intervention were not. Each additional factor involved increased level of harm (OR 2.08, $p < .001$) and nearly doubled likelihood of FTR (OR 1.93, $p < .05$).

Conclusion: Physician-attributable errors in diagnosis, technique, or judgment are more strongly correlated with harm than delays in diagnosis and intervention. Increasing number of errors identified in patient care correlates with an increasing level of harm and FTR.

Table:
Logistic Regression Model for Level of Harm and FTR

	Level of Harm (OR, [95% CI])	FTR (OR, [95% CI])
Age	1.01 [0.99, 1.03]	1.00 [0.97, 1.04]
Male	0.94 [0.53, 1.70]	0.67 [0.27, 1.72]
Charlson Score	0.91 [0.75, 1.1]	1.21 [0.88, 1.65]
ISS	0.98 [0.97, 0.996]*	1.05 [1.03, 1.07]***
Delay	1.38 [0.77, 2.50]	0.73 [0.23, 2.08]
Error	2.59 [1.38, 4.92]**	1.81 [0.59, 5.22]
Nature of injury	1.97 [1.13, 3.43]*	1.80 [0.72, 4.64]
Number of factors	2.08 [1.50, 2.91]***	1.93 [1.15, 3.27]*
Any operation	0.56 [0.33, 0.95]*	0.98 [0.37, 2.45]

Key: '***' = $p < 0.001$ '**' = $p < 0.01$ '*' = $p < 0.05$

Poster # 125

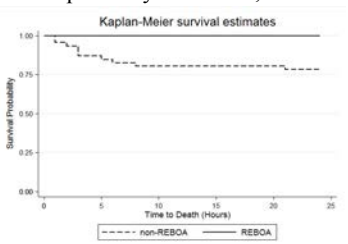
Resuscitative Endovascular Balloon Occlusion of the Aorta may improve survival among severely injured unstable patients experiencing post-intubation hypotension

Ramiro Manzano Nunez MD, Claudia P. Orlas MD, Michael W. Parra MD, Juan P. Herrera-Escobar MD, Maria A. Londoño Camilo J. Salazar Juan E. Ruiz-Yucuma Alexander Salcedo MD, Jose J. Serna MD, Juan J. Melendez MD, Camilo A. Peña MD, Edison Angamarca MD, Fernando Rodriguez MD, Alberto F. Garcia MD, Carlos A. Ordoñez* MD, Fundacion Valle del Lili

Introduction: We hypothesized that the deployment of REBOA among hemodynamically unstable (HU) trauma patients experiencing post-intubation hypotension (PIH) can result in improved survival. **Methods**: Retrospective analysis performed at a Level I Trauma Center between December, 2014 and January, 2018 of all adult torso trauma patients who 1) underwent surgery 2) developed PIH and were 3) HU (SBP<=90) upon arrival to the operating room. We excluded patients who were intubated prior to their arrival to the ER. Patients were subsequently divided into two groups: REBOA and -REBOA. All patients were treated upon arrival according to established damage control resuscitation (DCR) principles, and all REBOA's were inserted in the operating room after intubation by the treating trauma surgeon. All PIH patients were managed equally by the supervising attending anesthesiologist by means of DCR and vasopressors when required. The predicted survival rate was calculated usi ng the TRISS method and a Kaplan-Meier survival analysis of both the REBOA and the non-REBOA groups. **Results:** A total of 391 surgical torso trauma patients arrived at our institution during the study period. Of these, fifty-nine patients developed PIH and were HU upon arrival to the OR. The table presents an overview of patients' clinical characterist ics and differences between groups. The predicted survival rates in the REBOA and non-REBOA groups were 80.7% and 82% respectively. However, the actual survival rate in the REBOA group exceeded the calculated predicted survival by 11.6%. Although overall initial survival was not significantly different between the groups, REBOA patients demonstrated an improved trend for greater survival (P=0.07) **(Fig)**. **Conclusion:** We were able to show that the use of a REBOA in HU trauma patients experiencing PIH may underpin these patients initial ability to survive this second hit and thus may improve on their overall survival. Our findings provide a glimpse of the possible positive effect of REBOA of ameliorating the negative effects of PIH on these patients' already physiological fragile situation. We advise that these results deserve further investigation.

TABLE	Total (n= 59)	REBOA (n=13)	non-REBOA (46)	p-value
Male, n (%)	47 (79.6%)	8 (61%)	39 (84%)	0.08
Age*	30 (22-37)	34 (25-45)	29.5 (22-36)	0.3
Trauma Mechanism				
Blunt	8 (13.5%)	3 (23%)	5 (11%)	0.3
Penetrating	51 (86.5%)	10 (77%)	41 (89%)	0.3
GSW	36	6	30	0.3
SW	15	4	11	0.7
ISS*	25 (25-29)	25 (25-41)	25 (25-26)	0.055
Ps*	0.96 (0.72-0.94)	0.92 (0.72-0.94)	0.97 (0.76-0.98)	0.1
Initial Lactate*	5.2 (3.2-5.2)	5.7 (4.1-5.7)	5 (2.9-5)	0.5
PRBCs 24h*	4 (2-7)	6 (4-10)	4 (2-6)	0.2
Plasma 24h*	4 (2-8)	6 (4-9)	4 (0-6)	0.052
Platelets 24 h*	0 (0-6)	6 (0-6)	0 (0-6)	0.7
Cryoprecipitate 24h*	1 (0-12)	6(0-6)	0 (0-10)	0.06
Crystaloids 24h*	5760 (3849-6100)	4715 (3849-6100)	5850 (4090-8620)	0.4
SBP at the OR*	70 (60-80)	65 (50-76)	71 (65-80)	0.058
SOFA day 2*	5 (2-7)	5.5 (4-8)	4 (2-7)	0.1
Dialysis, n (%)	6 (10%)	2 (15%)	4 (9%)	0.6
Mortality in first 24h	10 (16.9%)	0 (0%)	10 (21.7%)	0.09
Calculated predicted survival rate (TRISS), (%)	81.6%	80.7%	82%	NA
Real Survival Rate	79.6% (n=47)	92.3% (n=12)	76% (n=35)	0.2

GSW, Gunshot Wound; SW, Stab Wound; ISS, Injury Severity Score; Ps, Probability of Survival; PRBC, Packed Red Blood Cells; SBP, Systolic Blood Pressure; *= median (IQR); Continuous variables were compared the Wilcoxon ranksum test; Categorical variables were compared using chi-2 or fisher exact test



Poster # 126

EARLY OPERATIVE MANAGEMENT IS A COST-EFFECTIVE STRATEGY IN PATIENTS WITH ADHESIVE SMALL BOWEL OBSTRUCTION: A POPULATION-BASED, RETROSPECTIVE COST-EFFECTIVENESS ANALYSIS

Ramy Behman MD, Nicole Look Hong MD, MSc, Petros Pechlivanoglou Ph.D., Paul Karanicolas MD,Ph.D., Avery Nathens* MD,MPH,Ph.D., University of Toronto, Department of Surgery

Introduction: Adhesive small bowel obstruction (aSBO) is a recurrent, potentially chronic surgical illness. While conservative management is often successful, operative intervention for aSBO is associated with a lower risk of recurrence. The long-term costs and benefits to patients of different management strategies for aSBO are not well understood. We sought to compare the long-term cost-effectiveness of two competing strategies for the management of aSBO: Trial of Conservative Management (TCM, the current standard of care) and Early Operative Management (EOM).

Methods: We performed a retrospective cost-effectiveness analysis using health administrative data. We identified patients admitted to hospital with their first episode of aSBO between 2005-2013 and created propensity-matched cohorts based on patients' likelihood to undergo EOM, defined as surgery the day-of or day-following admission. Patients were followed forward over a 5-year time horizon to determine the number of recurrences and adverse events as well as overall survival and accumulated inpatient-costs to the healthcare system. Utility scores were attributed to aSBO-related events and we estimated the incremental cost-effectiveness ratio (ICER) in terms of dollars per quality-adjusted life-year (QALY). Cost estimates are reported from the perspective of the health system in adjusted 2014 Canadian dollars.

Results: 25,150 patients were admitted for their first episode of aSBO and 3,174 (13%) were managed by EOM. After matching, patients in each management strategy were well-balanced with regards to age, sex, comorbidity burden, and socioeconomic status. After 5 years of follow-up, the average accumulated costs associated with EOM exceeded those of TCM ($17,752 vs $11,602, $p<0.0001$). However, patients managed by TCM were 58% more likely to experience a recurrence of aSBO (20.9% vs 13.2%, $p<0.0001$). These recurrences and the associated adverse events contributed to a long-term survival benefit and overall net effectiveness in terms of QALYs associated with EOM. The ICER associated with EOM decreased with each additional year of follow-up, representing increasing cost-effectiveness over time. After 5 years of follow-up the ICER of EOM compared to TCM was $26,608/QALY.

Conclusion: Optimal strategies of care for aSBO should consider long-term outcomes and costs, including risks of recurrence and associated adverse events. Within 5 years following the first episode of aSBO, EOM is a cost-effective approach to care compared to TCM. Guidelines regarding the role of early surgical intervention for aSBO should be revisited in view of this evidence.

Poster # 127

A Propensity Matched Analysis Of Outcomes In Cases Of Elderly Patients Who Fell From Ground Level At Home With Normal Vital Signs At The Scene: High Level Vs. Low Level And Unranked Trauma Center Care

Nasim Ahmed* MD, Patricia Greenberg MS Jersey Shore University Medical Center

Introduction:According to the field triage criteria from the Center for Disease Control, injured elders who experience a ground level fall should be taken to a high-level trauma center if they have a history (hx) of anticoagulation use. Therefore, the purpose of the study was to evaluate whether the higher level of care significantly affected the outcomes of elderly patients who fell from ground level at home and had a normal physiological examination at the scene.

Methods:Patients aged 65 and above, with normal physiological measures at the scene (Glasgow Coma Score (GCS) = 15, systolic blood pressure (SBP) > 90 and < 160, heart rate ≥ 60 and ≤100) from the 2011-2014 National Trauma Data Bank (NTDB) data sets were included in the study. Patients' characteristics, existing comorbidities, and outcomes were compared between the American College of Surgeons' (ACS) Level 1 or 2 designated trauma centers (Group 1) and the ACS Level 3, 4, and Unranked designated trauma centers (Group 2). Following initial analyses, propensity score matching was performed and the rate of in-hospital mortality, median hospital length of stay, and discharge disposition was compared between the matched groups.

Results:Of the 40,800 patients who met the study inclusion criteria, 19,290 (47.3%) were transported to a Level 1 or 2 trauma center and the remaining 21,510 (52.7%) were taken to Level 3, 4, or Unranked trauma centers. There were significant baseline differences ($p<0.05$) between the two groups regarding gender, race, the injury severity score (ISS), and existing comorbidities [hx of smoking, chronic kidney disease (CKD) requiring dialysis, hx of cerebrovascular accident (CVA), diabetes mellitus (DM), and hypertension (HTN) requiring medication]. After propensity score matching on age, gender, race, SBP, heart rate, respiratory rate, ISS, smoking status, CKD, CVA, DM, and HTN status, all characteristics except ISS (Median [IQR]: 9 [4, 9] vs 9 [4, 9], $p<0.001$) were well balanced and 18,813 patients remained in each group. There were no significant differences regarding in-hospital mortality (2.5% vs. 2.3%, $p=0.19$) or time to hospital discharge (Median [95% confidence interval]: 5 [5, 5] vs. 5 [5, 5], $p=0.07$) between Groups 1 and 2 respectively. However, there was a significant increase in the proportion of patients who required services after discharge in Group 2 (78.9% vs. 81.7%, $p<0.001$).

Conclusion:Cases of elderly patients whose physiological parameters are within normal limits at the scene of a fall from ground level have been associated with a higher risk of in-hospital mortality and significant morbidity requiring additional care after discharge from the hospital. In this study, higher levels of care failed to show any significant survival benefits or shorten the time to hospital discharge; however, a significantly higher proportion of patients who went to lesser-care facilities required follow-up services after discharge.

Poster # 128

NECROTIZING SOFT TISSUE INFECTION (NSTI) IS ASSOCIATED WITH PERSISTENT INFLAMMATION, HIGH RESOURCE UTILIZATION AND POOR LONG-TERM FUNCTIONAL OUTCOMES.

Scott Brakenridge* MD, Alicia Mohr* MD, Gabriela Ghita Babette Brumback Ph.D., Chasen Croft MD, Martin Rosenthal MD, R. S. Smith* MD, Lyle L. Moldawer Ph.D., Philip Efron* MD, Frederick Moore* MD, University Of Florida

Introduction: Necrotizing soft tissue infection (NSTI) remains an acutely life threatening and surgically morbid condition, with aggressive debridement remaining the mainstay of care. The long-term systemic inflammatory phenotype and functional outcomes of these patients remain poorly defined.

Methods: We analyzed all NSTI within a single-center, prospective longitudinal cohort of critically ill surgical patients with sepsis. Clinical data included demographics, clinical course, procedural interventions, and organ dysfunction parameters. Circulating inflammatory biomarkers were measured serially between 0.5 and 28 days. Health-related quality of life (HRQOL) and performance status assessments were performed at 3 and 6 month follow-up visits. Surgical urosepsis (i.e., required minimally invasive sepsis source control) patients within the cohort were utilized as a comparison group.

Results: Over a 24-month period, 33 critically-ill NSTI and 25 urosepsis patients were enrolled with similar baseline characteristics. NSTI source location included perineum (42%), lower extremity (39%), torso (9%) and neck (9%). Early physiologic derangement was severe in NSTI (and simlar to the urosepsis group) based on APACHE II (median 16, IQR 13-22), and max SOFA (7, IQR 4-11) scores, with 30% (n=10) requiring vasopressor support. Surgical source control required a median of 2 (IQR 1-3) debridement and 750cm ^{2} (IQR 126-1200) of soft tissue excision. Both NSTI and urosepsis (n=25) patients showed similar incidence of MOF, max SOFA score, and peak inflammatory biomarker levels (IL-6, IL-8, IL-10, CRP), which remained persistently elevated out to 28 days in both sepsis groups. However, NSTI patients had significantly longer hospital LOS (median 15 vs 7 days, p=0.004). While there were no inpatient NSTI deaths, 84% required either a post-discharge transitional facility (LTAC/Rehab/SNF; n=14, 42%), or extended home health care resources (n=14, 42%). In contrast to urosepsis patients (who returned to pre-admission baseline), NSTI patients showed persistently lower HRQOL as compared to baseline values across multiple domains at 3 months (EQ-5D utility index mean difference, -0.1270, p=005). Additionally, overall performance status remained limited and significantly worse than baseline at both three (WHO/Zubrod score 2.03±0.36, mean difference 0.786, p=0.006) and 6 months (Zubrod score 1.90±0.39, mean difference; 0.607, p=0.002) after NSTI onset.

Conclusion: Despite low inpatient mortality, NSTI remains a morbid condition with high incidence of MOF and an immunophenotype of persistent inflammation. Additionally, NSTI is associated with high resource utilization, persistent performance status deficits and decreased HRQOL out to 6 months from onset. Novel advances in early pharmacologic and long-term rehabilitation strategies are likely necessary to further improve NSTI outcomes.

Poster # 129

HEALTH CARE UTILIZATION PORTENDS ECONOMIC DISABILITY AFTER INJURY IN CAMEROON

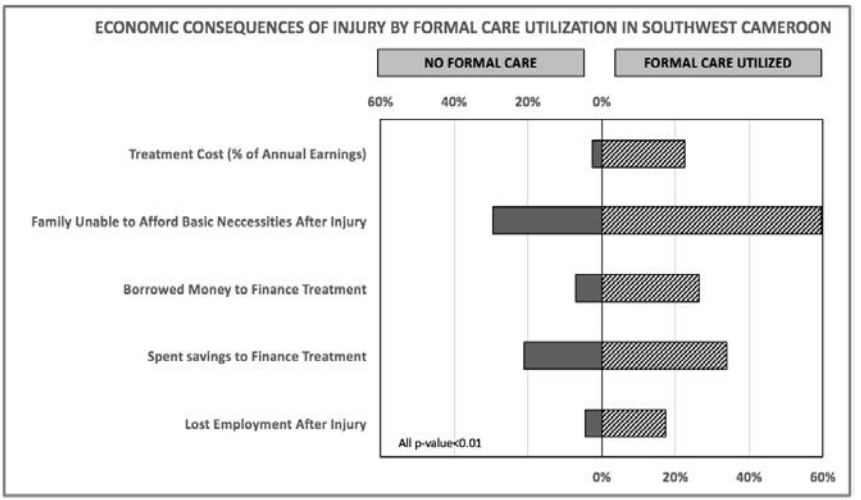
S. A. Christie MD, Drusia C. Dickson BA, Alain Chichom-Mefire MD, Theophile Nana MD, Mbiarikai A. Mbianyor MS, Patrick M. Stern II, BA, Rochelle A. Dicker* MD, Catherine Juillard* MD,MPH, University Of California San Francisco

Introduction:The United Nations has declared establishing Universal Health Coverage by 2030 to be a top health priority. Sub-Saharan Africa has among the highest rates of injury in the world but limited data suggest that many injured persons do not utilize formal medical services after injury due to cost constraints. In this study, we report the first population data on patterns, barriers, and economic consequences of care utilization after injury in Cameroon to establish targets for expanding access to care and improving trauma outcomes.

Methods: We performed a mixed-methods community based survey on injury in an urban-rural region of Cameroon. Three-stage cluster sampling was used to select target households. Data was collected on all injuries occurring in the preceding 12 months including care utilization, disability and economic outcomes. All survey data was adjusted for cluster sampling.

Results: Of 8065 individuals surveyed, 503 injuries were identified. Over 1/3 (35%) of injured persons did not utilize formal medical services. Disability affected 68% of injured persons and resulted in over 11,000 lost days of work in the sample projecting to an estimated 2 million days of work lost annually in the region. Family economic hardship after injury was substantially worse among the injured cohort who utilized formal care. Adjusted for age and severity, this group had higher treatment costs, more lost wages and employment, and more frequently resorted to economic coping strategies such as borrowing money or liquidating assets (all $p<0.01$). Formal medical care utilization in Cameroon was found to be an independent predictor of severe economic hardship after injury, defined as new inability to afford food or rent (aOR 1.69, $p= 0.03$).

Conclusion: Injury in Southwest Cameroon leads to substantive disability and impedes regional economic growth. Formal medical services must be made economically viable to expand utilization. Financial restructuring of emergency care in Cameroon has considerable potential to mitigate poor outcomes for affected families and communities after injury.



Poster # 130

TRAUMA PATIENTS ADMITTED TO NON-SURGICAL SERVICES – A MARKER FOR POOR OUTCOME

Frederick B. Rogers* MD, Shreya Jammula BS, Eric H. Bradburn DO, Alan D. Cook* MD, Susan P. Schulz MD, Jeanette Ward MS-CR, Juliet Altenburg RN, MSN Lancaster General Health/Penn Medicine

Introduction:Trauma systems and trauma centers were designed to optimize outcomes post trauma. After initial trauma evaluation, trauma patients are occasionally admitted to non-surgical services. We hypothesized that trauma patients admitted to a surgical service (SS) would have lower mortality than those admitted to a non-surgical service (non-SS).

Methods: The Pennsylvania Trauma Outcome Study database was retrospectively queried from 2003-2015 for adult (age ≥15) trauma patients admitted to accredited trauma centers in Pennsylvania. Patients dead on arrival and burn mechanism of injury were excluded. Patients were identified based on admitting service: surgical vs. non-surgical. Baseline patient demographics and incidence of comorbidities between the two groups were determined. Multilevel mixed-effects logistic regression model controlling for demographic and injury severity covariates were utilized to determine the adjusted impact of admitting service on mortality.

Results: 379,420 patients met inclusion criteria (SS: 354,748, non-SS: 24,672). Patients admitted to SS were significantly younger, more severely injured and more likely to be male. When adjusted for demographic and clinical characteristics (Table 1), admission to SS was associated with lower odds of mortality (AOR 0.827, p<0.001). Of note, patients who had delayed craniotomies had higher odds of dying on non-SS compared to SS (AOR 3.421 vs. 1.677) (Table 2).

Conclusion: Admission to non-surgical service appears to be a marker for a deleterious outcome in trauma patients. Patients with delayed craniotomies may be better managed on a surgical service because of improved neuro critical care. Trauma accrediting organizations should ensure that successful verification of trauma centers includes few trauma patients admitted to non-surgical services.

Table 1. Adjusted odds ratio for mortality in trauma patients.

		Mortality
Variable	**AOR** (95% CI)	*p*
Surgical service	0.827 [0.751-0.911]	<0.001
Major surgery	2.917 [2.771-3.071]	<0.001
Admission GCS	0.750 [0.746-0.753]	<0.001
		AUROC: 0.9152

*Adjusted for age, gender, ISS and ICU LoS

Table 2. Adjusted odds ratio for trauma mortality based on admitting service.

Mortality	Surgical service		Non-surgical service	
Variable	**AOR** (95% CI)	*p*	**AOR** (95% CI)	*p*
Craniotomy				
No craniotomy	Reference	---	Reference	---
Early (≤4h)	1.564 [1.462-1.673]	<0.001	0.930 [0.543-1.590]	0.930
Delayed (>4h)	1.677 [1.486-1.893]	<0.001	3.421 [1.744-6.713]	<0.001
	AUROC: 0.9121		**AUROC: 0.9121**	

*Adjusted for age, gender, ISS, admission GCS and ICU LoS

Poster # 131

RESUSCITATIVE THORACOTOMY IN ISOLATED PENETRATING TRAUMA TO THORAX, DOES TRAUMA CENTER DESIGNATION MAKES A DIFFERENCE?

Jorge Con MD, Asad Azim MD, Kartik Prabhakaran MD, Ansab Haider MD, Matthew E. Bronstein MD, Rifat Latifi* MD, Westchester Medical Center

Introduction: Patients with isolated penetrating trauma to the thorax who arrive with signs of life (SOL) and lose pulse in Emergency Department (ED) are most likely to benefit from Resuscitative Thoracotomy (RT). The aim of our study was to determine the differences in RT attempt rate and survival rate after RT between various levels of trauma center (TC) designation in patients with penetrating trauma to the thorax.

Methods: We performed 5-year (2011-2015) analysis of National Trauma Databank. All patients >18 years of age were included. Patients with isolated penetrating trauma to thorax who arrived ED with SOL were identified. Patients who lost vitals in ED were defined as those who died in ED or underwent RT. RT was defined as patients who underwent Exploratory Thoracotomy (PCODE: 34.02) within 1-hour of ED arrival. RT attempt rate was calculated as a percentage of patients who underwent RT out of all patients who lost vitals in ED. RT attempt rate and survival rate were compared.

Results: A total of 54,780 patients with isolated penetrating trauma to the thorax were identified. Mean ± SD age was 32±15, 82% were male and 62% were white. Mechanism of injury (Gunshot: 72.3%, Stab: 27.7%). 90.4% (49,521) of the patients arrived at the ED with signs of life of which 11.9% (5917) lost vitals in ED (Died in ED: 2265, Underwent RT: 3562). Overall RT attempt rate was 60.2% which has increased from 45.2% in 2011 to 68.7% in 2015 ($p=0.002$). RT attempt rate was highest in Level-1 TC at 74.4% followed by Level-II at 61.1% and was lowest in Level-III TC at 48.2% ($p<0.001$). Level-1 TC had better survival rate after RT as compared to level II and III TC (42.4% vs 31.1% vs 29.2%; $p=0.013$).

Conclusion: Our analysis demonstrates a significant increase in RT attempt rate over 5 years on patients with an isolated penetrating chest injury. Level-1 trauma centers had the highest RT attempt rates and the highest survival rates. Further studies are required to identify the factors influencing the decision to perform RT and to identify the factors associated with better survival in this cohort of patients.

Poster # 132

CAN CHEST ULTRASONOGRAPHY REPLACE THE CHEST X-RAYS DURING THE INITIAL EVALUATION OF STABLE PATIENTS WITH PENETRATING THORACIC TRAUMA?

Adolfo González MD, Ricardo Urzola MD, Juan F. Osorno MD, Isabel C. Angel MD, Jose J. Serna MD, Alexander Salcedo MD, David O. Acero MD, Diego F. Valdez MD, Paula Ferrada MD, Diego Caycedo MD, Orlando Arévalo MD, Juan C. Puyana* MD, Ramiro Manzano-Nunez MD, Carlos A. Ordoñez* MD, Alberto F. Garcia MD, Hospital Universitario Del Valle

Introduction: Recent literature suggests that chest ultrasonography (CUS) is an accurate tool for the diagnostic assessment of traumatic hemothorax and pneumothorax and thus, many consider CUS a reliable and accurate alternative to chest-Xray (CXR). However, current guidelines still recommend the use of chest-Xray for the diagnosis of these conditions. So far, there has been little discussion about the diagnostic yield of CUS in patients with penetrating chest trauma (PCT) who present stable to the trauma bay. Our objective was to evaluate the diagnostic accuracy of CUS for the emergency diagnosis of pneumothorax and hemothorax in stable patients with PCT.

Methods: A consecutive series of stable patients with PCT was prospectively included. Subjects submitted to emergent procedures and patients with trauma in the cardiac box were excluded. The initial evaluation was performed following ATLS guidelines. The findings of the CUS were registered and not used in the decision process.

Results: A total of 436 patients were included, 415(95.2%) were male. Trauma mechanisms were stab wound in 286 patients (65.6%) and gunshot in 150 (34.4%). Chest X-Rays showed hemothorax in 73 cases (16.7%), pneumothorax in 58 (13.3%) or both in 47 (10.8%) cases. One hundred seventy-six patients (40.4%) required a procedure. Sensitivity for the detection of any intrapleural collection, hemothorax alone, pneumothorax alone or the selection to a therapeutic procedure fluctuated between 0.56 to 0.86. The specificity ranged from 0.87 to 0.94. (Table)

	Sensitivity	Specificity	LR (+)	LR (-)
Abnormal chest R-Ray	0,74	0,87	5,98	0,29
Hemothorax	0,56	0,93	8,15	0,47
Pneumothorax	0,60	0,94	10,36	0,42
Thoracic procedure	0,86	0,88	7,48	0,15

Conclusion: CUS obtained during the initial evaluation of stable patients with penetrating trauma is a good tool to confirm but not to rule out intrapleural collections or the need of a therapeutic procedure. Although CUS seems unable to replace CXR, it seems to be a valuable adjuvant diagnostic modality in the initial diagnostic approach of patients with PCT who present hemodynamically stable to the trauma bay.

Poster # 133

CONTINUOUS PARAVERTEBRAL ANALGESIA - IMPROVED OUTCOMES DESPITE INCREASED RIB FRACTURES

Rindi Uhlich MD, Parker Hu MD, Jeffrey Kerby* MD,Ph.D., Patrick Bosarge* MD,
University of Alabama Birmingham

Introduction: Rib fractures may result in significant morbidity and mortality. Epidural analgesia provides superior pain control, but its use may be limited due to associated injuries, risk of complications, and lack of qualified personnel. Continuous local anesthetic may be provided directly to the effected intercostal nerves via a paravertebral catheter (PC). PC are widely available and easily placed at bedside. We sought to evaluate outcomes of patients with multiple rib fractures following the addition of PC to existing multimodal therapy.

Methods: Trauma patients with multiple rib fractures were reviewed retrospectively from 2015-2018 in a case-control study. All patients managed with PC were matched to controls with multiple rib fractures in a 1:2 ratio using injury severity score (ISS), age, and gender. Rib fractures were characterized by total number, laterality, and flail segments. PC placement including timing, duration, and fracture coverage was recorded. Rib fracture related morbidity was defined as the occurrence of unplanned intubation, extubation failure, tracheostomy requirement, pneumonia, and death. Multivariate regression models were used to assess the addition of PC with pulmonary morbidity.

Results: Forty-eight patients managed with PC were compared to 96 matched controls. Patients with PC had a significantly greater 30-day (15.9±6.43 vs. 13.2±9.94, p=0.048) and 90-day (74.7±12.53 vs. 63.3±28.12, p=0.001) hospital free days despite higher average number of rib fractures (9.3±3.73 vs. 6.6±4.11, p=0.001) and flail segments (2.0±2.94 vs. 0.8±1.76, p=0.02) compared to those without PC. The incidence of pneumonia (4.2% vs. 16.7%, p=0.03) and hospital mortality (2.1% vs. 13.5%, p=0.03) was significantly lower in patients managed with PC. Use of PC was significantly associated with decreased likelihood of pulmonary morbidity when controlling for age, ISS, and number of rib fractures (OR 0.27, p=0.008; 95 CI 0.10 – 0.71).

Conclusion: PC use is associated improved outcomes in patients with multiple rib fractures managed with standard multimodal therapy.

Poster # 134

Don't rush to a wide-open chest when diagnosing a hemopericardium in hemodynamically stable patients with penetrating injuries to the cardiac box

Adolfo González-Hadad MD, Juan F. Osorno-Moncayo MD, Isabel C. Ángel-Escobar MD, Jose J. Serna MD, Alexander Salcedo MD, David O. Acero MD, Ramiro Manzano-Nunez MD, Maria P. Naranjo MD, Julian Chica MD, Diego F. Valdez MD, Ricardo Urzola MD, Carlos A. Ordoñez* MD, Juan C. Puyana* MD, Sandra Carvajal MD, Alberto F. Garcia MD, Universidad Del Valle

Introduction: Currently, there is growing will toward a non-operative approach in cases of patients with traumatic hemopericardium who present hemodynamically stable. However, most trauma surgeons hesitate to perform these kinds of procedures and instead rush to the operating room and perform unnecessary chest open surgeries. We sought to describe the management and outcomes of a series of patient's victims of penetrating injuries to the cardiac box and definitive evidence of hemopericardium.

Methods: This is a retrospective case series performed with data obtained from a prospectively collected database, from January 2015 to December 2017. We included patients with penetrating wounds to the precordial area that arrived hemodynamically stable to the trauma bay of our level-I trauma center and were diagnosed with hemopericardium through a pericardial window.

Results: A total of 183 patients with penetrating injuries to the precordial area and hemodynamically stable upon arrival to the trauma bay were seen at our institution during the study period. Of these, 32 had hemopericardium evidenced by a pericardial window (by thoracoscopy=9; by subxiphoid approach=23). Most patients were young [Age, median: 25 (IQR, 19-30)]. Three and twenty-nine patients were victims of gunshot wounds and stab wounds respectively. Median (IQR) of ISS was 17 (10-17), and 31 patients had serious intrathoracic injuries (AIS≥3). Fifteen patients had an associated lung injury that required tube thoracostomy placement; these patients had a median (IQR) of hemothorax of 600 (300-800). Nineteen patients underwent an open chest surgical intervention of which 17 and 3 underwent thoracotomy and sternotomy respectively. These patients presented a median (range) of Penetrating Cardiac Trauma Index (PCTI) of 10 (10-25). 12 patients underwent pericardiotomy and drainage of hemopericardium either by thoracoscopy (n=8) or by subxiphoid exploration (n=3). These patients had a median (range) of PCTI of 10 (0-10). Overal, 40% of patients did not require any cardiac repair. Of these, five patients were in the group of patients that underwent thoracotomy or sternotomy.

Conclusion: We found that almost half of patients with evidence of traumatic hemopericardium did not require therapeutic cardiac operative interventions after a definitive diagnostic pericardial window which suggests that amongst these populations mandatory thoracic incision for definitive surgical repair may not always be indicated. We advise that these findings deserve further investigation.

Poster # 135

‘PAIN’-TING A PICTURE: CHARACTERIZING CONTINUOUS INTERCOSTAL NERVE BLOCKS FOR THE PAIN MANAGEMENT OF ADULT TRAUMA PATIENTS WITH MULTIPLE RIB FRACTURES

Neal Lynch PA, Catherine Koola MPH, Alessandro Orlando MPH, Krislyn Foster DO, Allen Tanner II, MD, Charles Mains* MD, Victor Portillo MD, David Bar-Or MD, Penrose - St. Francis Health Center

Introduction: Achieving satisfactory pain management among patients with multiple rib fractures (MRF) is critical to the prevention of pulmonary complications. Continuous intercostal nerve blocks (CINB) utilizing non-narcotic--based analgesia are proposed for patients with MRF, and we hypothesized that CINB would provide decreased pain during treatment compared to epidural (EPI) or intravenous analgesia (IVA).

Methods: This was a retrospective multicenter study of adult (18+ years) patients admitted for isolated MRF (3+ fractures) to four trauma centers (three Level I and one Level III) from 06/1/2012 to 06/30/2016. Patients were excluded if they had an abbreviated injury scale score >2 for body regions outside the chest, were treated solely with oral analgesia, or had no pain scores either before or during treatment. The primary outcome was change in average pain numeric rating scale (NRS; 0-10) from PRE (up to 6 hours prior to analgesic treatment initiation) to DURING (duration of treatment). We compared the mean change in pain between patients treated with CINB, EPI, and IVA. Secondary outcomes included hospital length of stay (LOS) and intensive care unit LOS (ICULOS). Univariate differences in patient characteristics were evaluated with ANOVA and chi-squared tests, and outcomes were evaluated with adjusted generalized linear models.

Results: Of the 109 patients included, 53 (49%) received CINB, 22 (20%) received EPI, and 34 (32%) received IVA. Overall, the majority of patients were male (70%), sustained an injury through a fall (47%), had a unilateral rib fracture (83%), and had a mean (SD) injury severity score (ISS) of 11.9 (3.6). CINB patients had similar demographic and clinical characteristics to EPI patients but were significantly more likely to be older (≥65 years, $p=0.02$) and have more rib fractures (≥7, $p<0.001$) than IVA patients. Prior to treatment, mean (SD) pain NRS scores were 4.5 (3.0), 4.6 (2.4), and 5.8 (3.0) for CINB, EPI, and IVA patients, respectively ($p=0.10$). After adjustment for age and PRE pain, mean (SE) pain changes were -0.5 (0.2) for CINB, -0.7 (0.4) for EPI, and -0.8 (0.3) for IVA, suggesting no significant effect of treatment group on change in pain ($p=0.86$). Patients treated with CINB had a significantly shorter mean (SD) ICULOS (0.6 (1.0) days, $p<0.001$), but not hospital LOS, after adjustment, compared to EPI and IVA patients.

Conclusion: CINB provided comparable pain relief to EPI and IVA. Average pre-treatment pain was relatively low across all treatment groups, and change in pain was also minimal. CINB treatment was associated with significantly reduced ICULOS, in contrast to the results of a prior study comparing CINB to EPI pain management of rib fractures. With the potential for decreased rates of narcotic addiction, CINB might offer an efficient alternative for pain control in this population, even among patients with a greater number of fractures. Future research should assess pain longitudinally to characterize pain relief over time while on CINB treatment.

Poster # 136

AMNIOTIC FLUID ALLOGRAFT ENHANCES HOST RESPONSE TO VENTRAL HERNIA REPAIR USING ACELLULAR DERMAL MATRIX

Jeffrey L. Van Eps MD, Dmitry Zavlin MD, Christian Boada BS, Aaron Shi Dan Bonville* MD, Joseph F. Buell MD, Warren A. Ellsworth MD, Joseph Fernandez-Moure MD, Houston Methodist Hospital, Dept Of Surgery

Introduction: Ventral hernia repair (VHR) with acellular dermal matrix (ADM) is plagued by high rates of recurrence. We have previously shown that augmenting repair with allogeneic growth factors can enhance ADM incorporation and reduce recurrence. Amniotic fluid allograft (AFA), a growth factor rich fluid, has been shown to improve wound healing. We sought to assess the effect of AFA on VHR with ADM. We hypothesized that AFA would modulate the host response to improve ADM incorporation.

Methods: Lewis rats (n-36) underwent ventral hernia creation and repair with porcine non-crosslinked ADM 30 Days (d) later. AFA was applied to mesh prior to skin closure and tissue harvested at 3d, 14d, and 30d. To assess incorporation, H&E stained slides were scored using a previously validated histomorphometric score based on cellularization, presence of multinucleated giant cells, neovascularization, connective tissue organization, mesh encapsulation, and degradation. Expression of genes positively associated with wound healing (Col1, Col3, VEGF, and ACTA) was then quantified using RTPCR. To assess the host inflammatory response, expression of pro-inflammatory (iNOS, TNFα) and anti-inflammatory (Arg, IL-10, mrc) genes were similarly quantified.

Results: AFA-treated ADM showed greater histomorphometric scores at 14d (4.5 vs. 2.2, $p<0.001$) but no difference at 3d or 30d. Col1, Col3, and VEGF expression was increased at 3d. Col3 expression was increased at 14d. Col1 and ACTA expression was increased at 30d. Expression of inflammatory genes showed a persistent increase in Arg at all time points. IL-10 and iNOS expression, while initially low, were greater at 14 and 30d. TNF and mrc expression decreased throughout the study.

Conclusion: Augmentation with AFA caused enhanced expression of wound healing genes of early vascularization to later remodeling and regeneration, which correlated histologically with improved histomorphometric scores at later time points. Collectively this correlated with a host immune response characterized by increased anti-inflammatory gene expression. The differential pattern of inflammatory gene expression underscores the complexity of the immune response in wound healing and warrants further investigation. These findings suggest AFA may have a role as an adjunct in improving ADM incorporation in VHR.

Poster # 137

EXPLORATORY LAPAROTOMIES: ARE THEY ALL THE SAME?

Ambar Mehta MPH, Nicole Lunardi MSPH, David T. Efron* MD, Bellal A. Joseph* MD, Kent A. Stevens MD, Mariuxi Manukyan MD, Samir M. Fakhry* MD, Joseph V. Sakran MD,MPH, MPA Johns Hopkins School of Medicine

Introduction: Emergent exploratory laparotomies exhibit the highest mortality rate among all emergency general surgeries. This study aimed to characterize the most common diagnoses for which emergent laparotomies were performed and leverage these groups to improve risk-adjustment models for postoperative mortality.

Methods: We identified emergent exploratory laparotomies in the 2012-2015 Nationwide Inpatient Sample using AAST criteria. After tabulating all ICD-9 diagnosis codes within these hospitalizations associated with exploratory laparotomies, we divided them into clinically-relevant groups. We then included each diagnosis group as an individual covariate in a multivariable logistic regression for mortality. Using backwards elimination, we performed iterative regressions after removing groups not statistically associated with mortality ($P<0.05$). We repeated our analysis using forward selection, and then selected groups that were significant for mortality in both methods. Finally, using the area under the receiver's operator curve (AUROC), we evaluated the addition of these selected groups as individual covariates in a risk-adjustment model. All regressions additionally adjusted for patient and clinical factors, hospital clustering, and the Bonferroni correction.

Results: We identified 4127 patients with exploratory laparotomy as a primary procedure (median age: 50 years, 46.0% female, 62.1% white), with an overall mortality rate of 13.4%. Among all patients, we tabulated a total of 27 distinct diagnosis codes, which were clinically consolidated into 7 diagnostic categories (Table). These diagnostic categories captured a majority of the laparotomy patients (70.4%) in our database. Both backwards elimination and forward selection led to three common diagnosis categories associated with mortality: shock, ischemia, and obstruction (Table). Adjusting for these three diagnostic groups in a multivariable logistic regression assessing mortality increased the AUROC from 72.6% to 88.3%.

Forward selection of diagnosis groups associated with mortality	N (%)	Regressions		
		1st Round	2nd Round	3rd Round
Bleeding	26.7%	0.052		
Obstruction	23.5%	*<0.001	*<0.001	*<0.001
Sepsis	24.1%	*<0.001	0.036	
Shock	18.4%	*<0.001	*<0.001	*<0.001
Ischemia	12.1%	*<0.001	*<0.001	*<0.001
Perforation	10.6%	0.025		
Peritonitis	9.1%	0.650		

*P-value depicts significance after Bonferonni correction.

Conclusion: While the procedural designation of exploratory laparotomy reflects a variety of interventions, accounting for at least three associated diagnostic categories may improve the accuracy of risk-adjustment models for mortality. Validating such analytic standardization may optimize best research practices for emergency general surgery.

Poster # 138

DURATION OF ANTIBIOTIC THERAPY DOES NOT INFLUENCE INTRA-ABDOMINAL ABSCESS RATES FOLLOWING DAMAGE CONTROL SURGERY

Rindi Uhlich MD, Parker Hu MD, Jeffrey Kerby* MD,Ph.D., Patrick Bosarge* MD,
University of Alabama Birmingham

Introduction: Damage control surgery is associated with increased risk of postoperative infection, with rates of intra-abdominal abscess (IAA) formation between 10-30%. While guidelines exist recommending limited duration of presumptive antimicrobial therapy following injury, there is little data to guide duration of therapy following damage control laparotomy (DCL). We sought to determine if prolonged antimicrobial therapy, specifically with broad gram negative and anaerobic or antifungal agents, may lead to decreased rates of IAA after DCL.

Methods: Patients managed with DCL following trauma were retrospectively reviewed from 2011-2016 at an ACS verified Level 1 trauma center. Those with death within 48 hours were excluded. Demographic data, injury characteristics, antibiotic administration and duration, and outcomes were recorded. IAA was defined by positive culture or clinical identification of purulence. Antibiotics were categorized as providing broad gram positive, broad gram negative and anaerobic, or antifungal coverage. Narrow spectrum antibiotics were excluded. Patients were compared by duration of broad gram negative and anaerobic therapy, with 5 or more days considered prolonged therapy. Univariate analyses were performed and used to guide covariate selection for stepwise multivariate logistic regression.

Results: Two-hundred and thirty nine patients met inclusion criteria following DCL. The majority were male (82.0%, 196/239) and suffered penetrating injury (55.2%, 132/239). IAA complicated 33.9% (81/239) of patients. Patients with IAA were more likely to suffer gastric (19.8% vs. 7.6%, $p = 0.006$), colonic (48.1% vs. 32.9, $p = 0.02$), pancreatic (19.8% vs. 7.6%, $p = 0.006$), and renal (9.9% vs. 2.5%, $p = 0.01$) injury. There was no difference in duration of antimicrobial therapy on either univariate or multivariate analyses between patients with or without postoperative IAA following DCL.

Conclusion: Prolonged duration of antimicrobial therapy with broad gram negative and anaerobic or antifungal agents does not significantly decrease the likelihood of IAA formation following DCL. Further prospective investigation is needed to determine the utility of prolonged antimicrobial therapy in patients with significant risk of IAA.

Poster # 139

PATIENT CENTERED OUTCOME MEASURES ARE NEEDED FOR TRANSFUSION – MEASURING THE INCREASED RISK OF INFLAMMATORY COMPLICATIONS IN SPLENIC TRAUMA PATIENTS

Bryce N. Taylor MS, Niki Rasnake BSN, Kelly McNutt BS,RN, Sneha Bhat MD, Brian J. Daley* MBA,MD, University of Tennessee Medical Center, Knoxville

Introduction: Transfusion is best seen as a blood transplant. Blood products contain exogenous proteins and other foreign particles that elicit an immune response with an acute inflammatory reaction. An acutely injured individual has an inflammatory response. Inducing more inflammation with a transfusion in the setting of this already increased inflammatory state increases complications and mortality. From this second hit, an aberrant inflammatory cascade can arise leading to inflammatory derived complications such as SIRS/CARS and ARDS. Blood transfusion performance indicators from the Joint Commission and AABB do not address patient outcomes beyond indications and transfusion reactions.

Methods: We retrospectively analyzed patients admitted to a level 1 trauma center with a splenic injury between 2006 and 2016 in the Trauma Quality Improvement Program (TQIP). Our primary parameter was transfusion status, and our secondary parameter was the development of an inflammatory complication. We defined an inflammatory complication based on availability in TQIP and as being sepsis-like syndrome or acute respiratory distress syndrome (ARDS). Statistical significance ($p<0.005$) was established through the Pearson's Chi-Square test controlled for splenic injury treatment modality, either surgical or non-operative. We also analyzed all statistically significant results with a follow up linear logit model controlling for the injury severity scores, abbreviated injury score for the abdomen, age, gender, and comorbidities as confounders.

Results: 627 subjects were included, 237 in the population that was transfused and 390 in that population that was not transfused. Transfused patients experienced a much higher incidence proportions of inflammatory complications than those that were not transfused (0.131 vs 0.008, $p=0.000$). The transfused population experienced higher incidence proportions of both sepsis-like syndrome (0.046 vs 0.003, $p=0.000$) and ARDS (0.101 vs 0.005, $p=0.000$).

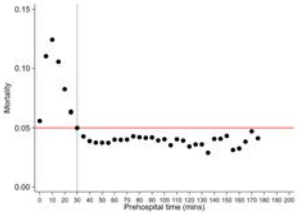
Conclusion: This data confirms an increased risk of inflammatory complications in patients that are transfused. Even though the overall incidence proportions in both populations are low, the transfused population still experienced an overwhelming increase in inflammatory complications when compared to the population that was not transfused. Transfusion must be used only when necessary and hemovigilance protocols must be strictly followed. Remaining cognizant of the increased risk of these complications in patients following transfusion will help to improve morbidity and mortality. We recommend tracking inflammatory complications as a method of performance improvement in transfusion.

Poster # 140

IDENTIFYING PATIENTS WITH TIME-SENSITIVE INJURIES: WHEN IS MORTALITY ASSOCIATED WITH INCREASING PREHOSPITAL TIME?

Joshua B. Brown MD, MSc, Xilin Chen MPH, Frank X. Guyette MD,MPH, Andrew B. Peitzman* MD, Timothy R. Billiar* MD, Jason L. Sperry* MD,MPH, University of Pittsburgh

Introduction: Severe injury is a time-sensitive disease. However, recognizing which patients have time critical injuries in the field is challenging, but would prioritize those for rapid transport to definitive care. Many recent studies have failed to identify an association between increasing prehospital time (PHT) and mortality after trauma. This may occur for two reasons; first is evaluation of unselected trauma patients unlikely to have time-sensitive injuries, and second is inherent survival bias in registry data since field deaths and those dying in closer nontrauma centers are not captured, the longer the patient survives to make it to a trauma center, the more likely the patient is to survive overall. Our objective was to determine if a subset of existing trauma triage criteria can identify patients in which mortality is associated with increasing PHT after accounting for potential survival bias.



Methods: Adult patients transported by EMS from the scene with total PHT<3h in the NTDB 2007-2015 were included. To overcome survival bias, mortality rates were plotted against PHT and cubic spline analysis used to identify an inflection where mortality increases to identify a marginal population in which PHT is more likely associated with mortality. Further analysis was conducted on only these patients. Logistic regression determined the association between mortality and total PHT, adjusting for demographics, transport mode, vital signs, ISS, urgent surgery, and complications. Robust variance estimators were used to account for center clustering. Interaction terms between existing trauma triage criteria and PHT were tested, with model stratification across triage criteria with a significant interaction to determine which criteria identify patients that have increased risk of mortality associated with increasing PHT. Multiple imputation and false discovery rate correction were used to address missing data and multiple comparisons respectively.

Results: Mortality risk increased in patients with total PHT≤30min (FIG), comprising a study population of 517,863 patients. The median total PHT was 26min (IQR 22-28) with a median ISS of 9 (IQR 4-14) and 7.4% mortality. Overall, PHT was not associated with mortality (AOR 0.998; 95%CI 0.993-1.002, p=0.332). Interaction analysis was significant for PH systolic blood pressure (SBP), Glasgow Coma Scale (GCS), and penetrating injury (p<0.05). Patients with SBP<90mmHg, GCS≤ 8, or penetrating injury had increased odds of mortality associated with increasing PHT (TABLE). When stratified by transport mode, the association between mortality and increasing PHT remained for ground but not helicopter transport.

Adjusted odds of mortality per 1-minute increase in total prehospital time

Triage criterion	*AOR*	*95%CI*	*p value*
SBP<90mmHg	1.008	1.001-1.016	0.034
GCS≤8	1.010	1.004-1.015	<0.001
Penetrating injury	1.010	1.003-1.018	0.005
Penetrating injury + SBP<90mmHg	1.014	1.004-1.025	0.012

Conclusion: In patients with short total PHT, prehospital hypotension, GCS≤ 8, and penetrating injury have higher mortality with increasing PHT. These patients may have truly time-sensitive injuries and benefit from rapid transport to definitive care. Further prospective research is necessary to refine the identification of patients with time-sensitive injuries in the field, and overcome the survival bias for patients with longer prehospital times.

Poster # 141

Analyses of the of the self-reported confidence level of ASSET course among participants and instructors

KENICHI HONDO MD, Koji Morishita MD,Ph.D., Kazuhide Matsushima MD,Ph.D., Ryuzo Abe MD,Ph.D., Takane Suzuki MD,Ph.D., Shunsuke Yoshikawa MD, Tomo Oka MD, Shigeto Oda MD,Ph.D., Yasuhiro Otomo MD,Ph.D., Tokyo Medical and Dental University

Introduction: ASSET (Advanced Surgical Skills for Exposure in Trauma) course is one of the Trauma Education courses developed by the American College of Surgeons, and it has been spread all over the world mainly in the United States since 2010. We conducted the ASSET courses in Japan in 2017. In this study, we analyzed the self-reported confidence level of each trauma surgical procedure using ASSET course questionnaire survey collected from participants and instructors.

Methods: A total of 16 participants were enrolled and completed the course evaluation. Participants were evaluated the self-reported confidence level using a 5-point Likert scale. 4 instructors evaluated the level of the participant they have that the participant can perform each procedure. We compared the score of the self-reported confidence level between student and instructor.

Results: The 44 items were evaluated by both participants and instructors regarding the cervical /chest / abdomen / upper limb / lower limb surgical procedure. The self-reported confidence level of the instructors (33/44/65/20/36) (median) were higher in the cervical, chest, and abdomen than that of the students (28/39/52/19/34).

Conclusion: The discrepancy of the evaluation might be influenced by several factors such as psychological element or experience. Further analyses of these factors would be an important in the future.

Poster # 142

Comparison with aortic cross clamping and resuscitative endovascular balloon occlusion of the aorta for sever torso trauma.

Hiroshi Yasumatsu Kazuki Mashiko MD, Nobuyuki Saito MD,MPH,Ph.D., Takanori Yagi MD, Yoshiaki Hara MD,Ph.D., Hisashi Matsumoto MD,Ph.D., Shock And Trauma Center, Nippon Medical School Chiba Hokusoh Hospital

Introduction:The use of resuscitative endovascular balloon occlusion of the aorta (REBOA) has increased in recent years. Our facility has employed aortic cross-clamping (AXC) for aortic occlusion (AO) during trauma resuscitation since 2000. However, the use of REBOA remains controversial. This study aims to compare AXC with REBOA in terms of survival discharge for patients with severe torso trauma.

Methods:This retrospective study was conducted at a single trauma center in Japan between 2012 and 2015, and included patients with AO. Seventy-five eligible patients with AO (excluding those with cardiac arrest on arrival) were divided into the following two groups based on the initial treatment decision: AXC (N=58) and REBOA (N=17). The association between the initial treatment decision and patient survival was examined using multivariable logistic regression analysis.

Results:This study included 75 patients (94.7%) who sustained blunt injuries with a median age of 61 [43–74] years. Prehospital treatment, including AXC, was performed to 78.7% of the patients. The initial treatment of 50 patients (86%) in the AXC group was converted from ACX to REBOA. There was no difference in age and Injury Severity Score (ISS) between the two groups. The AXC group had significantly lower chest injury proportion (Maximum Abbreviated Injury Scale ≥3), Revised Trauma Score (RTS), and prothrombin time (PT) activity (PT%) than the REBOA group (AXC vs. REBOA: chest injury, 94.8% vs. 64.8%, P=0.001; RTS, 3.07 [2.19–5.14] vs. 5.14 [4.82–6.71], P<0.001; PT%, 43.7 [34.4–61.1] vs. 68.9 [55.6–77.0], P=0.001). Additionally, the AXC group had higher lactate values than the REBOA group (8.8 [5.9–11.7] vs. 4.2 [3.1–7.6], P <0.001). Patients in the AXC group had a lower probability survival rate, which was calculated using the Trauma and Injury Severity Score method, and a lower actual survival rate than those in the REBOA group (9.7% vs. 31.3%, P=0.02; 24.1% vs. 52.9%, P=0.02, respectively). Multivariate analysis, which was adjusted for risk of age, ISS, and RTS, did not show a clear benefit of REBOA as a primary treatment choice on the survival discharge of patients with AO (odds ratio, 2.01; 95% confidence interval, 0.46–9.78; P=0.384). REBOA procedure-related complications was observed in 10.4% of the patients (7/67; vascular injury, 2; limb ischemia, 7).

Conclusion:AXC is a reasonable treatment choice for severe trauma patients with impending cardiac arrest. Although REBOA was selected for patients with high RTS, no remarkable difference in the survival discharge was observed between the REBOA and AXC groups. So far, REBOA cannot yet replace AXC as a treatment device for patients with severe trauma.

Poster # 143

POINT-OF-CARE ASSAY FOR THROMBIN GENERATION IN TRAUMA PATIENT AND HEALTHY DONOR FRESH BLOOD

Alexander Olson BS, Shannon Prior BS, Nathan Dow BS, Kalev Freeman MD,Ph.D., Saulius Butenas Ph.D., Zachary Miller BS, Zachary Osborn BS, University of Vermont

Introduction: Hemostatic potential in trauma patients may be assayed by measurement of viscoelastic clot strength, fibrinolysis, and quantitation of specific coagulation factors. One of these factors, thrombin, has demonstrated clinical relevance in predicting hypercoagulable events, and thrombin generation (TG) is accelerated in the presence of histones and Factor (F)XIa. There are no standard assays for measurement of thrombin generation in whole blood at the point-of-care. In this study, a new point-of-care device for measurement of TG in fresh whole blood was utilized to evaluate the contribution of histones and FXIa to procoagulant activity in trauma patients and heathy donors. Simultaneous measurement of clot formation with rotational thromboelastometry (ROTEM) methodology under identical or supplemental conditions was used to confirm the nature of procoagulant activity in the trauma population.

Methods: Blood from healthy volunteers and trauma patients (male and female) was collected into 3.2% sodium citrate. Anti-histone antibody (0.3 mg/mL) was added immediately ("0 minutes") or 15 minutes after blood draw, along with addition of corn trypsin inhibitor (CTI; 0.1 mg/mL) at 0 or 15 minutes to block contact pathway activation. CTI conditions with no anti-histone were also tested. Clot formation and TG were analyzed using ROTEM and point-of-care TG methodologies, respectively, in the presence and absence of an anti-FXIa antibody (0.1 mg/mL). Concentrations of FXIa were calculated using calibration curves generated from titrating purified FXIa into healthy donor blood.

Results: Whole blood samples from 14 trauma patients and 16 healthy volunteers were analyzed. Median ROTEM clotting times for the trauma patients were 8 +/- 4 minutes shorter than that of the healthy donors for a given condition. Median point-of-care TG lag phases in the trauma patients were 5 +/- 1.7 minutes shorter. Lag phases were reduced more than 4-fold if left to incubate for 15 minutes before addition of CTI, for both populations. All conditions exhibited prolonged lag phases and clot times in the presence of anti-FXIa antibody. For both assays, higher concentrations of FXIa were observed in the trauma patients than healthy donors. Moreover, FXIa concentration was reduced 2 to 3-fold following addition of anti-histone antibody at 0 minutes compared to 15 minutes.

Conclusions: Trauma patients demonstrated increased procoagulant activity compared to healthy donors, in both assays. The observed increases in activity are partially related to generation of FXIa over time in citrated blood. Furthermore, histones appear to amplify FXIa generation.

Poster # 144

The size of pelvic hematoma can be predictive factors for angioembolization in hemodynamically unstable pelvic trauma

Hak-Jae Lee MD,MPH, Nak-Jun Choi MD, Hyo-Geun No MD, Suk-kyung Hong MD,Ph.D., Asan Medical Center

Introduction:Unstable pelvic fracture with bleeding can be fatal, with a mortality rate of up to 40%. Therefore, early detection and treatment are important in unstable pelvic trauma. We investigated the early predictive factors for possible embolization in patients with hemodynamically unstable pelvic trauma.

Methods:From January 2011 to December 2013, 46 patients with shock arrived at a single-hospital within 24 hours after injury. Of them, 44 patients underwent computed tomography(CT) after initial resuscitation, except for 2 who were dead on arrival. Nine patients with other organ injuries were excluded. Seventeen patients underwent embolization. Demographic, clinical, and radiological data were reviewed retrospectively.

Results:Among 35 patients with hemodynamically unstable pelvic fracture, 22 (62.9%) were men. Width (p=0.002) and length (p=0.006) of hematoma on CT scans were significantly different between the embolization and non-embolization groups. The predictors of embolization were width of pelvic hematoma (odds ratio[OR]:1.07, p=0.028) and female sex (OR:10.83, p=0.031). The cut-off value was 3.35cm. More embolization was performed (OR:12.00, p=0.003) and higher mortality was observed in patients with hematoma width ≥ 3.35cm (OR:4.96, p=0.048).

Conclusion:Patients with hemodynamically unstable pelvic trauma have a high mortality rate. CT is useful for the initial identification of the need for embolization among these patients. The width of pelvic hematoma can predict possible embolization in patients with unstable pelvic trauma.

Poster # 145

Preparing Japanese surgeons for potential mass casualty situations will require systematic programs.

Hayaki Uchino MD, Victor Kong MD,Ph.D., John Bruce MD, George Oosthuizen MD, Wanda Bekker MD, Grant Laing MD,Ph.D., Damian Clarke MD,Ph.D., Kurashiki Central Hospital

Introduction: The ongoing state of global geo-political instability means that it is prudent to prepare civilian surgeons to manage major military-type trauma. many countries including Japan has experienced a prolonged period of peace and consequently it is unlikely that surgeons will have been exposed to a sufficient volume of trauma cases. This study reviews the state of trauma training and preparedness in Japan and reviews the trauma workload of a major Japanese emergency medical center and compared with a major South African trauma center with the intention of quantifying and comparing the time needed to gain adequate exposure to major trauma at the two centers.

Methods: The literature describing the surgical burden from a number of recent military missions was reviewed and the core surgical skills to manage military-type injuries were identified. We then went on to review all patients admitted to both Kurashiki Central Hospital (KCH) and Pietermaritzburg Metropolitan Trauma Service (PMTS) following trauma between the period September 2015 and August 2016. The burden of trauma at each center was quantified and the number of core surgical competencies or procedures performed at each center was then reviewed. These were then compared with the number of the core procedures which were performed on the reported military missions.

Results: Three reports on military surgical missions were reviewed. These came from the Dutch, French and British military surgical services. The most common procedures were wound debriedment and orthopedic fixation, followed by trauma laparotomy, neck exploration and thoracotomy. During the 12 month study period, 309 trauma patients were admitted to KCH. There were 10 penetrating injuries and 299 blunt injuries. Of the penetrating injuries, there were no gunshot wounds. The mechanisms of injury for blunt trauma were as follows: Road traffic accidents (RTAs); 141 (47%), fall; 136 (46%) and other injuries; 22 (7%). In the same period, 2887 trauma patients were admitted by the PMTS. There were 1244 cases (43%) of penetrating trauma and 1644 cases (57%) of blunt trauma in PMTS. The mechanisms of injury for penetrating trauma were as follows: Stab wounds (SWs); 955 (77%), gunshot wounds (GSWs); 252 (20%) and other injuries; 37 (3%) and for blunt trauma were as follows: Assault; 739 (45%), RTAs; 669 (41%), fall; 166 (10%) and other injuries; 70 (4%). The exposure to all the key competencies required to manage trauma is overwhelmingly greater in South Africa than Japan. The length of time needed to obtain an equivalent trauma exposure to that achieved in South Africa, working in Japan is prohibitively long.

Conclusion: Trauam training in Japan is hamstrung by a lack of clinical material as well as by systematic factors. Training a trauma surgeon is difficult. Developing a trauma system in the country may help address some of these deficits. South Africa in contrast has a huge burden of trauma and sufficient infrastructure to ensure that surgeons working there have adequate exposure to major trauma. Developing an academic exchange program between Japan and South Africa may allow for the transfer of trauma experience and skills between the two countries.

Poster # 146

Analysis of the Use of Anti-thrombin III in the Severe Trauma Patients..

MARU KIM Ph.D., DAESANG LEE Ph.D., The Uijeongbu St. Mary Hospital, The Catholic University Of Korea

Introduction: Antithrombin is a potent inhibitor of thrombin and have a properties of anticoagulant with anti-inflammatory property. In trauma patients, anti-thrombin level is inversely related with the injury severity score(ISS) and low anti-thrombin III level is related with multi-organ failure(MOF). We hypothesized that antithrombin could attenuate the detrimental effects on the inflammatory process and organ function. We evaluated the influence of anti-thrombin III on the MOF and mortality in the severe trauma patients (ISS>15)

Methods: This is a retrospective study using Trauma Database of our hospital between January, 2016 and December, 2016. Major trauma patients (ISS>15) with low anti-thrombin level(<70%) were enrolled in this study. We divide the patients into antithrombin using group(AT-III(+)) vs non-using group(AT-III(-)) and compare the mortality, MOF, bleeding event between two groups.

Results: Total 99 patients were included in this study and mean ISS score of the patients was 25.1. Antithrombin level of survivor group(59.3%) was higher than non-survivor group(44.7%)(p=0.002). All cause mortality of AT-III(+) (22%) was lower than AT-III(-) (33%)(p=0.791). MOF of AT-III(+) was 8% and lower than that of AT-III(-)(26%)(p=0.047)

Conclusion: Antithrombin level is inversely correlated with severity of trauma. There was no difference of mortality between antithrombin using group and non-using group. Antithrombin appear to attenuate the post traumatic response and multi organ failure.

Poster # 147

TRAUMATIC DIAPHRAGMATIC HERNIA: HOW TO IMPROVE THE DIAGNOSIS?

Vitor F. Kruger MD, Alcir E. Dorigatti MD, Bruno M. Pereira MD,Ph.D., Elcio S. Hirano MD,Ph.D., Jose B. Bortoto MD, Gustavo P. Fraga MD,Ph.D., University of Campinas, Brazil

Objective: Traumatic diaphragmatic hernia (TDH) is uncommon and difficult to diagnose in trauma patients. The aim of this study is present demographics, how to improve the diagnosis, surgical treatment and outcomes.

Method: This is a retrospective trauma registry based study in a single university trauma center between 1990-2017.

Results: A total of 3.003 trauma patients were submitted to exploratory laparotomy. 425 (14.1%) had a diaphragm injury AAST grade ³ II. TDH was identified in 55 cases (12.9%), with predominance of male (46 cases - 83.6%), and age ranging from 13 to 59 years old (median 34). Blunt TDH occurred in 40 cases (72.7%; automobile accident in 26 cases) and penetrating TDH in 15 cases (27.3%; stab wound in 9 cases). Diagnosis was made mostly by chest x-ray (CXR) in the trauma bay (31 cases - 56.3%), following the intraoperative finding (13 cases - 23%). Laparotomy was performed in 54 cases (98.1%) and only one patient with stab wound was treated by laparoscopy. In two patients with chronic TDH was necessary associated thoracotomy. In 13 patients (23.6%) with hemodinamically instability the diagnosis was intraoperatively, 2 cases with diagnostic peritoneal lavage. The surgical indication was based in CRX in the trauma bay in 30 cases (54,4%). computed tomography in 7 cases (12.7%), laparoscopy in 3 cases (5,4%), in 3 cases 2 converted to laparotomy. 49 cases with left side, 5 right side and 01 bilateral. The stomach was the organ most frequently found herniating into the chest (38 cases). The rate of pulmonary complications was 18 cases (66%).The LOS average was 14 days. The mean ISS was 24. Overall mortality was 20% (11 of 55).

Conclusion: TDH was identified in few trauma patients (1.8%) admitted at our hospital, mainly after blunt trauma. Despite advances in imaging methods, CXR is still useful in the diagnosis or suspicion of TDH and the ATLS® protocol should be followed. CT is helpful for the diagnosis of TDH and identifies associated injuries. Laparoscopy was useful diagnosis in three patients but only one was treated laparoscopilly. Laparotomy remains the gold standard for the diagnosis and treatment.

Poster # 148

OUTCOMES OF EMERGENCY DEPARTMENT LAPAROTOMY IN NON-RESPONDER AFTER RESUSCITATION; EARLY EXPERIENCE IN A SINGLE CENTER

Chan Ik Park MD, Jae Hun Kim MD, Pusan National University Hospital

Introduction: Outcomes of patients with bleeding depend on how rapid bleeding stop. Emergency department laparotomy is considered one of ways to reduce intra-abdominal bleeding. Here we evaluated the outcomes of emergency department laparotomy through the early experience of a single trauma center.

Methods: We reviewed medical records and data of patients who were non-responder after resuscitation and underwent emergency department laparotomy between January 2016 and December 2017.

Results: Twelve patients underwent emergency department laparotomy. Ten patients had sustained blunt trauma, and two were victims of abdominal stab wounds. Injuries to the small bowel, spleen, and liver were most common. One patient could not reach the operating room. Three of 12 were survived. One of three who were survived had severe neurologic sequelae.

Conclusion: Patients that underwent emergency department laparotomy showed high mortality. However, emergency department laparotomy can be considered as an option to reduce intra-abdominal bleeding for non-responder after resuscitation.

Poster # 149

Predictive value of computed tomography in diagnosing bowel and/or mesenteric injuries after blunt trauma: Correlation with surgery findings.

Kihoon Kim MD,Ph.D., Inje University Haeundae Paik Hospital

Introduction: Bowel and mesenteric injuries occur in about 5% of blunt abdominal trauma patients. Delay in diagnosis may increase the morbidity and mortality. Computed tomography(CT) is the current accepted standard imaging modality for abdominal organ injury diagnosis and is now considered accurate in the diagnosis of bowel and mesenteric injuries. There is still controversy as to how reliably CT alone could help identify those blunt bowel and mesenteric injuries requiring surgery. Aims of this study are to review the correlation between CT signs and intraoperative finding in case of bowel and mesenteric injuries following blunt abdominal trauma and identify the diagnostic specificity of those signs found at CT with practical considerations on the following clinical management.

Methods: This is single-center retrospective study of trauma patients from March 2010 to December 2017. All patients admitted to our hospital after blunt trauma and CT scan at admission were assessed. 211 patients required operative management following blunt trauma. Data were analysed correlating operative surgical reports with the preoperative CT findings.

Results: 77 patients presented bowel and/or mesenteric injuries. The median patient age was 50 years(12-75 years), 75% of the patients were male(n=58). 78% of the patients were CT grade 5. 3% of patients(n=2) showed CT grade 1. The median length of stay and ICU were 26 days(1-254) and 4 days(0-91)

Conclusion: All images, charts and tables must be placed and uploaded in the body of your abstract exactly as you want them (please remove this line when creating your abstract).CT scan is the gold standard in the assessment of intra-abdominal blunt abdominal trauma for not only parenchymal organs injuries but also detecting bowel and/or mesentery; in the presence of specific signs it may provides an accurate assessment of hollow viscus injuries, helping the trauma surgeons to choose the correct initial clinical management.

Poster # 150

CLINICAL SIGNIFICANCE OF CULTURE OF PAD USED FOR PACKING IN DAMAGE CONTROL LAPAROTOMY

Younggoun Jo MD, Yunchul Park MD, Jungchul Kim MD, Chonnam National University Hospital

Introduction: Damage control laparotomy (DCL) is a technique utilized to care of massively injured trauma patient. We conducted bacterial analysis of the pad used for packing in DCL and studied its association with morbidity and mortality.

Methods: This is a retrospective review of all patients undergoing immediate laparotomy at our institute between 2011 and 2015. DCL was defined as temporary abdominal closure at the initial surgery. 18 consecutive patients undergoing DCL were analyzed. Microbiologic samples from pad used in DCL were collected.

Results: 15 microorganisms were cultured. Samples from 12 (66.7%) patients were positive by microbiologic culture and six (33.3%) patients were negative. Morbidity rate (91.7% vs. 66.7%) and mortality rate (41.7% vs. 16.7%) were higher in patients with positive culture than patients with negative culture. Infection rates such as surgical site infection (75.0% vs. 33.3%) and sepsis (41.7% vs. 16.7%) were higher in culture-positive patients. Four patients underwent two or three take back surgeries and all samples from these patients were positive for microorganism.

Conclusion: There was a high infectious complication rate in patients with positive culture of pad. And two or more frequent take back surgery seems to increase risk of infection in DCL.

Poster # 151

A RARE CARDIAC TRAUMA BY MACHETE

BRUNO J. MEDEIROS MD, SURGERY INSTITUTE OF AMAZONAS STATE

Introduction: Chest trauma is one of the most common causes of death corresponding to 20 to 25 % of cases. It can be blunt or penetrating trauma. The majority of the patients, 85%, can be managed only with a tube thoracostomy and only 10 to 15 % will require a trauma *thoracotomy*. Conventional indications for emergency thoracotomy are divided into acute and not acute. One of the most common indications of thoracotomy in trauma is the amount of blood immediately exiting the thoracic drain: immediate drainage of 1,500 ml of blood and deterioration of the hemodynamic status.

Methods: This was an observational study characterized by clinical inspection of a patient with chest trauma by machete.

Results: A 37-year-old man entered on our emergency room at a central hospital of Rio Branco – ACRE, Brazil, with a blunt, linear, 20-cm (Figure 1) sucking chest wound on the right side, caused by a machete. Respiratory rate was 25 per minute, saturating 90%on ambient air, blood pressure (BP) of 110x70 mmHg and heart rate of 115 per minute, he was semiconscious. After the initial care, the patient becomes better and a great question came to mind: operate or treat conservatively?

Conclusion: Noting that the machete is a very contaminated object, used in various situations in agriculture, and that we are facing a large and deep lesion with a large part in the Ziedler area and that the machete as shown must have a great impact energy. We decided to go to the surgical center thinking that a large thoracic wound could not be well cleaned without general anesthesia. In the operating room, the lesion was enlarged to the lateral side and a Finochietto retractor was used. A large transversal laceration was observed on the pericardial sac, associated with phrenic nerve lesion and right diaphragm paralysis (Figure 2). At that moment the right anterolateral thoracotomy was complemented with a transverse sternotomy with the control of the proximal and distal right mammary artery. There was a right atrial lesion of about 3 cm with a large clot. The lesion was controlled with a Satinski tweezers and a running suture with 4-0 prolene. There was also an injury to the right ventricle with associated lesion of a distal branch of the right coronary artery, controlled with U stitches. (Figure 3)



Poster # 152

DELAYED RUPTURE OF SPLENIC PSEUDOANEURYSM AFTER BLUNT ABDOMINAL TRAUMA

Younggoun Jo MD, Yunchul Park MD, Jungchul Kim MD, Chonnam National University Hospital

Introduction: Incidence of splenic pseudoaneurysm after abdominal trauma could result in critical consequences. Here, we present a case of delayed rupture of splenic pseudoaneurysm after blunt abdominal trauma

Methods: A 68 year-old man referred to our hospital with an abdominal pain and hemodynamic instability. 3 months ago, he bumped into cultivator handle while he was moving the vehicle. At that time, he didn't undergo any examination about accident. On laboratory findings, hemoglobin was 9.1 g/dL and lactate was 2.0 mmol/L. Abdominal computed tomography(CT) showed large amout of perisplenic hematoma with irregular margin of spleen and hemoperitoneum at right paracolic gutter and pelvic cavity.

Results: An immediate angiography was performed. Superselective angiogram showed pseudoaneurysms at splenic artery branches. Coil embolization was condected with microcoils. 1 week later follow up CT showed no remarkable change of laceration of spleen without bleeding and patient was discharged without any problems.

Conclusion: After high powered blunt abdominal injury when possible proper evaluations should be performed to prevent the occurrence of late devastating events.

Poster # 153

Colonic stricture after angioembolization of pseudoaneurysm at left colonic artery

Jungchul Kim MD, Yunchul Park MD, Wuseong Kang MD, Yoiunggoun Jo MD,
Chonnam National University Medical School

Introduction: Rupture of pesudoaneurysm at mesentery can resulted in fatal consequences. Interventional radiology is one of the treatment method. Here, we present a case of delayed stricture of left colon after angioembolization at branch of left colonic artery.

Methods: A 68 year-old man referred to our hospital after cultivator rollover accident. Abdominal computed tomography(CT) showed liver laceration and segmental thrombotic occlusion in left common iliac artery.Percutaneous angioplasty was done at left common and external iliac artery. On the third day of hospitalization,patient showed sudden sign of shock and follow up abdomen CT showed bleeding in left mesentery with large amount of hemoperitoneum.

Results: An immediate angiography was performed.Selective angiogram showed pseudoaneurysms at ascending branch of left colic artery..Coil embolization was conducted with microcoils.1month later patient presented abdominal distension with pain and follow up abdomen CT showed left colonic abstruction .Emergency operation was performed and subtotal colectomy was done.

Conclusion: Angioembolization at coloninc artery can cause a rare complication, such as colon obstruction. Careful observation and follow up after procedure is mandatory for rapid diagnosis and treatment.

Poster # 154

DAMAGE CONTROL SURGERY WITH PAD PACKING FOR ACTIVE BLEEDING IN CRUSHING WOUND OF THE PERINEUM AND AMPUTATED LEG STUMP

Wuseong Kang MD,Ph.D., Wonkwang University Hospital

Introduction: We reported a case of crushing wound of the perineum and amputated leg stump which was treated by damage control surgery with pad packing.

Methods: A 67-year-old man had a crushing injury. His left leg was sucked in the wheel of a tractor. His systolic blood pressure and hemoglobin level upon admission were 50 mm Hg and 7.5 g/dL, respectively. His perineum and leg had multiple crushing open wounds and open fractures. The large defect of the leg wound was considered to require amputation above the knee, which was performed immediately with the closure of the perineal wound. However, a large volume of bloody discharge was observed in the perineal and leg stump wounds postoperatively. Massive transfusion was performed, and a second operation was performed. In the second operation, large bloody oozing of muscle and several arterial bleeders was observed. Although the bleeders were ligated, the bloody oozing continued. To control the bloody oozing, pad packing to the perineal and thigh stump wounds, and approximation with suture to compress the wound were performed. Diverting colostomy was performed to protect the wounds.

Results:After pad packing, the bloody discharge stopped and the pad was removed in the third operation. Owing to the large defects with infection of perineal and thigh stump wound, negative pressure wound therapy and repeated irrigation with debridement were performed. At 6 months after the first operation, his wound was completely healed, and colostomy repair was performed.

Conclusion: In this case, the hemodynamically unstable, crushing perineum wound and leg stumps were treated safely by damage control surgery with pad packing.

Poster # 155

LEFT VENTRICLE INJURY ASSOCIATED WITH CARDIAC TRAUMA BY GUNSHOT WOUND: A CASE REPORT.

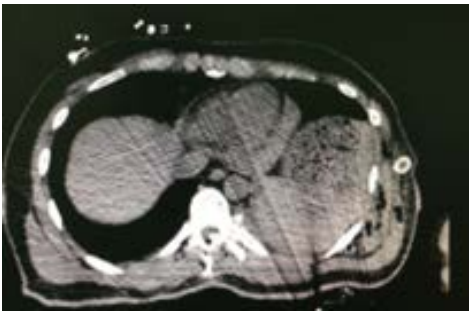
Francisco E. Silva Sr., MD, Rodrigo M. Féres Sr., MD, Ricardo J. Garcia Sr., MD, José Alfredo C. Padilha Sr., MD, Renata P. Pereira Sr., MD, Adriana M. Rangel Sr., MD, Raphael L. Coelho Sr., MD, Hospital Estadual Alberto Torres - Centro De Trauma

Introduction: The incidence of cardiac trauma is low in the universe of traumatic injuries. Right ventricle (RV) is the most affected cardiac chamber in the penetrating cardiac trauma.

Methods: R.L.R. 42, male, brought Trauma Center due to gunshot injury with an entry orifice in the left paravertebral dorsal region, with no exit orifice. During the initial clinical examination, the patient was eupneic in ambient air, vesicular murmur and pulmonary expandability reduced in the left hemithorax, O2 saturation 98%, systemic blood pressure of 210 x 110 mmHg, heart rate of 104 beats per minute. Glasgow Coma Scale 14.

Results: A left anterior thoracotomy was performed, showing hemopericardium, with left ventricular (LV) transfixing wound, with left posterolateral entry orifice and extensive anterolateral exit orifice associated with bulky bleeding. The patient was referred to the Intensive Care Center with satisfactory evolution.

Conclusion: Penetrating wounds of the left ventricle, even less common, may present a favorable outcome if approached and treated effectively.



Poster # 156

DAMAGE CONTROL IN ABDOMINAL TRAUMA: A CASE REPORT

Mariana N. Fernandes MD, Marcio R. Cruz Sr., MD, Hospital Geral Ernesto Simões Filho

Introduction: Hypothermia, coagulopathy and acidosis, a vicious cycle generally known as “the lethal triad”, contribute significantly to the increase in trauma-related mortality. Prolonged surgical time has been shown to worsen hemodynamic status, and if it is a reversible cause, such as hypovolemic shock, damage control should be the choice

Methods: A 24-year-old male patient was victim of multiples gunshots wounds in abdomen. At admission, he was unstable and in shock despite fluid resuscitation. At physical examination he presented an abdominal gunshot wound (left iliac fosse). Abdomen was flaccid and diffusely painful. On the laparotomy was evidenced lesion in 40% of the intestinal loop circumference at 80cm from the Treitz and lesion in 60% of the circumference of the sigmoid colon. Opted for damage control surgery through the raffia of small intestine lesion, sigmoid resection and burial of stumps, ureterostomy, anastomosis of the branches of the left iliac vein, using hemostats and pelvic tamponade. Referred to the ICU after 3 hours of surgery. A new reassembly was performed after 36 hours with removal of the compresses, catheterization of the ureter and terminal colostomy. He was discharged from the ICU after 13 days

Conclusion: Damage control has proven to be an important ally to the restoration of the physiological parameters of the polytraumatized patient. Due to the large number of injuries in this patient, we could not perform damage control in one hour as it is recommended. Even though it was not faithful to the ideal surgical time, the choice of controlling potentially fatal lesions was fundamental for better healing and enhance the patient’s hemodynamic status.

Poster # 157

TENSION PNEUMOTHORAX SECONDARY TO EXPANDING HEMORRHAGIC PNEUMATOCELE AFTER BLUNT CHEST TRAUMA

John V. Agapian MD, FACS, FCCM, Maxim Gusev MD, Hector Ludi MD, FACS, Arnold Tabuenca MD, FACS, Afshin Molkara MD, FACS University Of California, Riverside/RUHS; LLU

Introduction: Tension pneumothorax can lead to hemodynamic shock by impairing blood return to the heart and restricting cardiac output. Typically, this is may be due to a large pneumothorax or hemothorax. A pneumatocele is a cavity in the lung parenchyma usually filled with air that may result from pulmonary trauma. We present the first report of a hemorrhagic pneumatocele secondary to trauma resulting in a tension pneumothorax.

Methods: 18 year old male presented to trauma center in shock, complaining that 'he could not breathe'. He was subsequently intubated, and a right tube thoracosctomy placed for diminished breath sounds. Chest computerized tomography identified a large air-fluid cavity with extravasation of contrast, suggesting ongoing hemorrgae into the pneumatocele. The chest tube continued with scant output. Patient's hemodynamic condition continued to deteriorate, and repeat chest XR demonstrated significant right to left mediastinal shift. Right thoracotomy was performed and massive hematoma removed from the pneumatocele.

Results: The patient's hemodynamic condition improved after the large mass occupying hemothorax was evacuated from the hemorrhagic pneumocoele contained in the right chest cavity.

Conclusion: Hemorrhagic pneumatocele is rare, and has never been described as a cause for tension pneumothorax. Do to the location of hematoma, a conventional thoracostomy tube can not release the tension -a thoracotomy is needed. We describe the first report of a tension hemorrhagic pneumatocele.

Poster # 158

NON-OPERATIVE TREATMENT OF A TRAUMATIC GRADE V PANCREATC LESION - CASE REPORT

Maria F. Oliva Detanico MD, Rogerio Fett Schneider MD, Guilhermo Taglietti MD, Henrique Pauletti MD, Caroline Gargioni Barreto MD, Ledwyng D. Gonzalez Patino MD, Mariana Pasin Bergamaschi MD, Joao A. Argenton Zortea MD, Kathrine Meier MD, Gabriele Santos Persch MD, Shirley Lourenco Scorza MD, Hospital De Pronto Socorro De Canoas

Introduction: Although pancreatic trauma is not a common injury, the mortality could be as high as 50% in complex cases. The typical mechanism of injury is the compression of the epigastric area against the vertebrae. The current treatment for grade V lesions is the Whipple procedure.

Methods: Male patient, 18 years, transfered to our trauma center level I after 48h of a blunt abdominal trauma. The first attendance and diagnosis were made at a rural Hospital after 36h of trauma. He arrived at our facility hemodinamicaly stable but with a persistent abdominal pain and nausea. A new abdominal CT scan was made and showed a laceration at the pancreatic head and a large amount of free abdominal fluid.

Results: The surgical team decided to perform an exploratory laparotomy. During the procedure, it was diagnosed a large hematoma of head and uncinate process of pancreas, without other lesions (duodenum, bile duct and pancreatic body were intact). It was decided to only drain the abdominal cavity. It was started TPN in the immediate postoperative and the enteral feeding was re-started 10 days after the procedure with good acceptance; no other surgical procedure was done.

Conclusion: The patient was discharged after 28 days of hospitalization with a good evolution. He is still in follow-up without any complications.

Poster # 159

ENDOVASCULAR REPAIR FOR AXILLAR ARTERY INJURY - CASE REPORT

Fabiana Kain De Moura MD, Barbara Andreazza MD, Gustavo Antonio Giolo MD, Maria F. Oliva Detanico MD, Hospital De Pronto Socorro De Canoas

The use of endovascular technique for the correction of penetrating traumatic vascular injuries is being encouraged, especially for those which the traditional approach could have a higher morbidity due to the location. Lesions at the subclavian and axillar arteries are one of these cases

The case we present is male patient, 28y, that arrived at our hospital with a gunshot wound at the right shoulder without exit. At the first attendance, he was instable due to a pneumo/hemothorax which was promptly drained. After the clinical stabilization, he still didn't have right braquial/ radial pulse, but the arm had good perfusion (no pain, good warming and capillary filling). An angiography by CT scan was performed and showed partial lesion of axillar artery but with good distal perfusion. As the patient remained stable, he was transferred for another hospital and the endovascular repair was done with a good result.

Poster # 160

A case series study of blunt trauma causing aortic injury.

Shusuke Mori MD,Ph.D., Tomohiko Ai MD,Ph.D., Yasuhiro Otomo MD,Ph.D., Tokyo Medical and Dental University

Introduction: Aortic injury caused by blunt trauma is common but it presents various types of injury. Most cases are found dead or to have already fallen into a cardiopulmonary arrest when the patient arrives at a hospital. Some cases demonstrate progressive or delayed onset of aortic injuries, especially aortic dissections, which are sometimes difficult to treat. This study is to investigate what types of aortic injuries caused by blunt trauma are seen in one of the largest trauma centers in Japan.

Methods: Retrospective review of the patient records of blunt trauma cases with aortic injury for 10 years since 2007 in one of high volume trauma centers in Japan was performed. Each case alive on arrival was discussed in detail.

Results: Out of approximately eighty thousand ambulance cases and thirty thousand admissions for 10 years in total, only 19 cases showed an aortic injury caused by blunt trauma. A total of 11 cases presented a cardiopulmonary arrest on arrival, and 8 cases of them seemed to have died mainly of severe aortic injury and the rest died of other organ injuries. Eight cases were alive on arrival and 2 of them were initially asymptomatic. Types of aortic injury were Stanford type A aortic dissections in 3 cases, type B in 3 cases, and aortic rupture in 2 cases. Two cases of type A dissection underwent an emergency operation, whereas all 3 type B dissections went on a good course with conservative treatment.

Conclusion: Aortic injury caused by blunt trauma is rare in Japan. Stanford type B aortic dissections did not require aortic repair and showed good prognoses.

SCHOLARSHIP FUND

RESEARCH SCHOLARSHIP RECIPIENTS
AMERICAN ASSOCIATION
FOR THE SURGERY OF TRAUMA
1988 – 2018

WINTHROP

1988 – 1989	Stephen E. Morris, M.D.

AAST/SHERWOOD DAVIS & GECK

1988 – 1989	Sandra Beale, M.D.
1989 – 1990	Christine Cocanour, M.D.
1989 – 1990	Daniel J. Johnson, M.D.
1991 – 1992	Eric J. DeMaria, M.D.
1991 – 1992	Scott A. Dulchavsky, M.D., Ph.D.
1991 – 1992	Lena Napolitano, M.D.
1992 – 1993	Mark D. Cipolle, M.D., Ph.D.
1992 – 1993	William J. Mileski, M.D.
1993 – 1994	David A. Spain, M.D.
1993 – 1994	James R. Wallace, M.D., Ph.D.
1994 – 1995	Carnell Cooper, M.D.
1994 – 1995	David A. Spain, M.D.
1995 – 1996	Robert N. Cooney, M.D.
1995 – 1996	Charles N. Mock, M.D., M.P.H., Ph.D.
1996 – 1997	J. Perren Cobb, M.D.
1996 – 1997	Chong-Jeh Lo, M.D.
1997 – 1998	Kimberly A. Davis, M.D., M.B.A.
1997 – 1998	Joseph T. Murphy, M.D.
1998 – 1999	Kenneth H. Sartorelli, M.D.
1998 – 1999	Joseph T. Murphy, M.D.

AAST/WYETH-AYERST SCHOLARSHIP AWARD

1999 – 2000	Grant O'Keefe, M.D., M.P.H.
2000 – 2001	James C. Jeng, M.D.
2001 – 2002	Eileen M. Bulger, M.D.

AAST/JOHN B. DAVIS RESEARCH SCHOLARSHIP AWARD

1994 – 1995	Paul E. Bankey, M.D., Ph.D.
1995 – 1996	Chong-Jeh Lo, M.D.
1996 – 1997	Robert N. Cooney, M.D.
1997 – 1998	Charles N. Mock, M.D., M.P.H., Ph.D.
1998 – 1999	Jeffrey S. Young, M.D.
1999 – 2000	Glen A. Franklin, M.D.
2000 – 2001	Glen A. Franklin, M.D.

2001 – 2002	Alan D. Murdock, M.D.
2002 – 2003	Eileen M. Bulger, M.D.
2003 – 2004	Toan T. Huynh, M.D.
2004 – 2005	Louis J. Magnotti, M.D.
2005 – 2006	Gregory P. Victorino, M.D.
2006 – 2007	Carrie A. Sims, M.D.
2007 – 2008	Vishal Bansal, M.D.

AAST/RESEARCH & EDUCATION SCHOLARSHIP AWARD

2002 – 2003	Gregory P. Victorino, M.D.
2003 – 2004	Saman Arbabi, M.D., M.P.H.
2004 – 2005	Saman Arbabi, M.D., M.P.H.
2006 – 2007	Mark R. Hemmila, M.D.
2007 – 2008	Suresh Agarwal, Jr., M.D.

AAST/RESEARCH & EDUCATION FOUNDATION SCHOLARSHIP AWARD

1999 – 2000	Kenneth H. Sartorelli, M.D.
2000 – 2001	Andrew J. Michaels, M.D., M.P.H.
2001 – 2002	Kimberly A. Davis, M.D.
2001 – 2002	James A. Murray, M.D.
2002 – 2003	Susan I. Brundage, M.D., M.P.H.
2002 – 2003	Colleen E. Jaffray, M.D
2003 – 2004	Raminder Nirula, M.D., M.P.H.
2003 – 2004	Kathryn M. Tchorz, M.S., M.D.
2004 – 2005	Jason J. Hoth, M.D.
2004 – 2005	Obeid Ilahi, M.D.
2005 – 2006	Carlos V.R. Brown, M.D.
2005 – 2006	Rochelle A. Dicker, M.D.
2005 – 2006	Ajai K. Malhotra, M.D.
2006 – 2007	Michel Aboutanos, M.D., M.P.H.
2007 – 2008	Barbara A. Gaines, M.D.
2008 – 2009	Timothy Browder, M.D.
2008 – 2009	Tam Pham, M.D.
2009 – 2010	Eric Ley, M.D.
2009 – 2010	Tam Pham, M.D.
2010 – 2011	Jared M. Huston, M.D.
2010 – 2011	Eric Ley, M.D.
2011 – 2012	David A. Machado-Aranda, M.D.
2011 – 2012	Susan Rowell, M.D.
2012 – 2013	Todd Costantini, M.D.
2012 – 2013	Steven Schwulst, M.D.
2013 – 2014	Susan Evans, MD
2013 – 2014	Robert David Winfield, MD
2014 – 2015	Jacob Glaser, M.D
2014 – 2015	Angela Ingraham, M.D.
2014 – 2015	Jon Simmons, M.D.

2015 – 2016	Matthew Delano, M.D.
2015 – 2016	Benjamin Levi, M.D.
2015 – 2016	Matthew D. Neal, M.D.
2016 – 2017	Robert Becher M.D.
2016 – 2017	Damien Carter, M.D.
2017 – 2018	Vanessa Nomellini, M.D., Ph.D.
2017 – 2018	Jonathan Wisler, M.D., MS
2017 – 2018	Samuel P. Mandell, M.D., M.P.H.
2018 – 2019	Vanessa Ho, M.D., M.P.H.
2018 – 2019	Marta McCrum, M.D., M.P.H.
2018 – 2019	Deepika Nehra, M.D.

AAST/NOVO NORDISK RESEARCH AWARD IN HEMOSTASIS AND RESUSCITATION

2006 – 2007	Mitchell Jay Cohen, M.D.
2008 – 2009	Mitchell Jay Cohen, M.D.
2009 – 2011	Matthew Rosengart, M.D., M.P.H.

THE ACS, AAST AND NIGMS JOINTLY SPONSORED MENTORED CLINICAL SCIENTIST DEVELOPMENT AWARD (K08/K23)

2006 – 2011	Mark R. Hemmila, M.D.
2007 – 2012	Alicia Mohr, M.D.
2008 – 2013	Mitchell Jay Cohen, M.D.
2009 – 2013	Jason J. Hoth, M.D.
2010 – 2013	Jason Sperry, M.D.
2011 – 2013	Carrie Sims, M.D.

AAST/ETHICON RESEARCH GRANT IN LOCAL WOUND HAEMOSTATICS AND HEMORRHAGE CONTROL

2007– 2008	Kenji Inaba, M.D.
2008 –2009	Jose Pascual, M.D.
2009 –2010	Jennifer Watters, M.D.
2010 – 2011	Jeffrey S. Ustin, M.D.

AAST/KCI RESEARCH GRANT IN WOUND CARE

2007 – 2008	Therese M. Duane, M.D.
2008 – 2009	Michael Corneille, M.D.
2009 – 2010	Ziad C. Sifri, M.D.
2010 – 2011	Lydia Lam, M.D.
2011 – 2012	Laurie Punch, M.D.

AAST/CIMIT RESEARCH FELLOWSHIP IN THE FIELD OF TECHNOLOGY IN TRAUMA AND CRITICAL CARE

2009 – 2010	Jeffrey Ustin, M.D.
2010 – 2011	David King, M.D.

2017 AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA
RESEARCH AND EDUCATION FUND DONORS:

(Donations received January 1, 2017– December 31, 2017)

Dr. Charles Adams, Jr.
Dr. John Adamski II
Dr. Nikhilesh Agarwal
Dr. Suresh Agarwal, Jr.
Dr. John Armstrong
Dr. Richard Bagdonas
Dr. Chris Bandy
Dr. Stephen Barnes
Dr. Erik Barquist
Dr. Andrew Bernard
Dr. James Betts
Dr. Mary-Margaret Brandt
Dr. Susan Briggs
Dr. William Bromberg
Dr. Carlos Brown
Dr. Eileen Bulger
Dr. Clay Burlew
Dr. Andre Campbell
Dr. Jeannette Capella
Dr. Matthew Carrick
Dr. William Cioffi
Dr. Christine Cocanour
Dr. Raul Coimbra
Dr. Arthur Cooper
Dr. Michael Cripps
Dr. Martin Croce
Dr. James Cushman
Dr. Imad Dandan
Dr. Omar Danner
Dr. Kimberly Davis
Dr. Marc de Moya
Dr. Demetrios Demetriades
Dr. Jody DiGiacomo
Dr. Warren Dorlac
Dr. Jay Doucet
Dr. Thomas Duncan
Ms. Christine Eme
Dr. Blaine Enderson
Dr. Thomas Esposito
Dr. Susan Evans
Dr. Mary Fallat
Dr. Richard Fantus
Dr. David Feliciano
Dr. Lewis Flint
Dr. Rajesh Gandhi
Dr. Donald Gann
Dr. Fernando Garcia
Ms. Sharon Gautschy

2017 AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA
RESEARCH AND EDUCATION FUND DONORS:

(Donations received January 1, 2017– December 31, 2017)

Dr. Thomas Genuit
Dr. Richard Gonzalez
Dr. Kirby Gross
Dr. Ronald Gross
Dr. Oliver Gunter
Dr. Weidun Guo
Dr. Mark Hamill
Dr. Kimberly Hendershot
Dr. Sharon Henry
Dr. Howard Hermans
Dr. Jan Horn
Dr. Jennifer Hubbard
Dr. Bellal Joseph
Dr. D'Andrea Joseph
Dr. Christoph Kaufmann
Dr. Krista Kaups
Dr. Paul Kearney
Dr. Edward Kelly
Dr. Orlando Kirton
Dr. Stanley Klein
Dr. David Kluge
Dr. M. Margaret Knudson
Dr. Jaromir Koci
Dr. Stanley Kurek, Jr.
Dr. Anna Ledgerwood
Dr. Frank Lewis
Dr. Eric Ley
Dr. David Livingston
Dr. Charles Lucas
Dr. Hector Ludi
Dr. Linda Maerz
Dr. Ronald Maier
Dr. Mark Malangoni
Dr. Ajai Malhotra
Dr. Matthew Martin
Dr. William Marx
Dr. Michael Metzler
Dr. Anthony Meyer
Dr. Andrew Mikulaschek
Dr. Richard Miller
Dr. Joseph Minei
Dr. Ernest Moore
Dr. Matthew Moorman
Dr. Sharon Moran
Dr. David Mulder
Dr. Yoshinori Murao
Dr. Alan Murdock
Dr. John Myers

2017 AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA
RESEARCH AND EDUCATION FUND DONORS:

(Donations received January 1, 2017– December 31, 2017)

Dr. Pal Naess
Dr. Mayur Narayan
Dr. Russell Nauta
Dr. Edmond Ng
Dr. Kathleen O'Hara
Dr. Patricia O'Neill
Dr. Pauline Park
Dr. Nancy Parks
Dr. Andrew Peitzman
Dr. Ruben Peralta
Dr. Walter Pizzi
Dr. Charles Rice
Dr. Bryce Robinson
Dr. Susan Rowell
Dr. Grace Rozycki
Dr. Ilan Rubinfeld
Dr. Jack Sava
Dr. Thomas Scalea
Dr. Henry Schiller
Dr. Carl Schulman
Dr. Kevin Schuster
Dr. Jason Sciarretta
Dr. Steven Shackford
Dr. Forest Sheppard
Dr. John Sherck
Dr. Carrie Sims
Dr. Michael Sise
Dr. David Spain
Dr. Ronald Stewart
Dr. Erik Streib
Dr. Ronald Tesoriero
Dr. Scott Thomas
Dr. Errington Thompson
Dr. Glen Tinkoff
Dr. Gail Tominaga
Dr. Bartholomew Tortella
Dr. Garth Utter
Dr. Wendy Wahl
Dr. Brett Waibel
Dr. Jennifer Watters
Dr. Jordan Weinberg
Dr. Michaela West
Dr. Sonlee West
Dr. James Wyatt, III
Dr. Mauro Zago

2018 AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA
RESEARCH AND EDUCATION FUND DONORS:

(Donations received January 1, 2018– August 1, 2018)

Dr. Amy Goldberg
Dr. Andrew Bernard
Dr. Andrew Peitzman
Dr. Arthur Cooper
Dr. C. William Schwab
Dr. Craig Brenner
Dr. David Edelman
Dr. Donald Klotz, Jr.
Dr. Edward Kelly
Dr. Ernest Gonzalez
Dr. Fernando Garcia
Dr. Jaromir Koci
Dr. Jody DiGiacomo
Dr. John Fildes
Dr. John Pickhardt
Dr. John Steele
Dr. Jonathan Groner
Dr. Karyn Butler
Dr. Kathleen O'Hara
Dr. Krista Kaups
Dr. Lillian Kao
Dr. Lonnie Frei
Dr. M. Margaret Knudson
Dr. Mark Shapiro
Dr. Martin Croce
Dr. Mauro Zago
Dr. Michael Moncure
Dr. Nikhilesh Agarwal
Dr. Pal Naess
Dr. Pardon Kenney
Dr. Paul Schenarts
Dr. Ronald Stewart
Dr. Ronald Tesoriero
Ms. Sharon Gautschy
Dr. Stephen Kaminski
Dr. Steven Glorsky
Dr. Thomas Esposito
Dr. Thomas Scalea
Dr. Wendy Wahl
Dr. Yoshinori Murao

2017-2018 AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA FUND 20*forTwenty* DONORS

(Donations received August 1, 2017 - July 6, 2018)

Dr. A. Britton Christmas
Dr. A. Tyler Putnam
Dr. Adam Fox
Dr. Ajai Malhotra
Dr. Alexander Eastman
Dr. Andre Campbell
Dr. Anil Srivastava
Dr. Arthur Cooper
Dr. Barbara Gaines
Dr. Bartholomew Tortella
Dr. Brandon Bruns
Dr. Brett Waibel
Dr. Charles Adams, Jr.
Dr. Christian Minshall
Dr. Clay Burlew
Dr. David Edelman
Dr. David Notrica
Dr. David Skarupa
Dr. Deborah Kuhls
Dr. Eleanor Winston
Dr. Elliott Haut
Dr. Erik Barquist
Dr. Ernest Block
Dr. Fernando Garcia
Dr. Forest Sheppard
Dr. Gail Tominaga
Dr. George Maish, III
Dr. Gregory Timberlake
Dr. Hector Ludi
Dr. Howard Hermans
Dr. Imad Dandan
Dr. James Betts
Dr. Jay Doucet
Dr. Jody DiGiacomo
Dr. John Santaniello
Dr. Joseph Minei
Dr. Julie Wynne
Dr. Karen Brasel
Dr. Kimberly Davis
Dr. Laura Johnson
Dr. Mark Cipolle
Dr. Marko Bukur
Dr. Mary-Margaret Brandt
Dr. Matthew Carrick
Dr. Matthew Moorman
Dr. Mbaga Walusimbi
Dr. Michael Cripps
Dr. Michael Dubick
Dr. Michael Hayashi
Dr. Michael Sise
Dr. Nikhilesh Agarwal
Dr. Oliver Gunter
Dr. Richard Bagdonas
Dr. Richard Miller
Dr. Robert Winfield
Dr. Ronald Stewart
Dr. Ruben Peralta
Ms. Sharon Gautschy
Dr. Sharon Moran
Dr. Stephanie Savage
Dr. Stephen Kaminski
Dr. Steven Glorsky
Dr. Steven Shackford
Dr. Suresh Agarwal, Jr.
Dr. Thomas Broadie
Dr. Thomas Scalea
Dr. Warren Dorlac
Dr. William Marx

2017 AAST #GIVINGTUESDAY DONORS

#GivingTuesday is a global day of giving fueled by the power of social media and collaboration.

Dr. Charles Adams, Jr.
Dr. Suresh Agarwal, Jr.
Dr. Scott Armen
Dr. Chris Bandy
Dr. Andrew Bernard
Dr. James Betts
Dr. Carlos Brown
Dr. Eileen Bulger
Dr. Todd Costantini
Dr. Clay Cothren Burlew
Dr. Martin Croce
Dr. Omar Danner
Dr. Kimberly Davis
Dr. Bradley Dennis
Dr. Jody DiGiacomo
Dr. Heather Dolman
Dr. Jay Doucet
Dr. Joseph DuBose
Dr. Thomas Duncan
Dr. Richard Falcone, Jr.
Dr. Mary Fallat
Dr. Richard Fantus
Dr. David Feliciano
Dr. Rajesh Gandhi
Ms. Sharon Gautschy
Dr. Kirby Gross
Dr. Oliver Gunter
Dr. Elliot Haut
Dr. Sharon Henry
Dr. Jeffrey Kerby
Dr. Eric Ley
Dr. David Livingston
Dr. Lawrence Lottenberg
Dr. Hector Ludi
Dr. Linda Maerz
Dr. Matthew Martin
Dr. Christopher Michetti
Dr. Alan Murdock
Dr. Jasmeet Paul
Dr. Andrew Peitzman
Dr. Gerd Pust
Dr. Michael Rotondo
Dr. Grace Rozycki
Dr. Jeffrey Salomone
Dr. Thomas Scalea
Dr. Kevin Schuster
Dr. Mark Seamon
Dr. Jason Smith
Mrs. Jermica Smith
Dr. David Spain
Dr. Ronald Stewart
Dr. Ronald Tesoriero
Dr. Eric Toschlog
Dr. Mbaga Walusimbi
Dr. Sonlee West

IN MEMORY

IN MEMORY

Thomas L. Wachtel, M.D.
Paradise Valley, Arizona
(1938-2018)
Member Since 1977

Leonard Schweiberer, M.D.
Munich, Germany
(1930-2017)
Member Since 1998

Frederick W. Ackroyd
Boston, Massachusetts
(1930-2017)
Member Since: 1930

H. Bruce Williams
Montreal, Canada
(1929-2017)
Member Since: 1967

AAST WAS NOTIFIED IN 2017 THAT

THE FOLLOWING MEMBERS ARE DECEASED

Henry C. Cleveland, M.D.
Denver, Colorado
(1924-2016)
Member Since: 1962

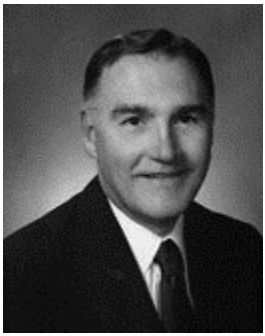
John F. Connolly, M.D.
Orlando, Florida
(1936-2007)
Member Since: 1936

Calvin B. Ernst, M.D.
Juniper, Florida
(1934-2015)
Member Since: 1983

Elmer R. Maurer, M.D.
Winter Haven, Florida
Member Since: 1952

David Yashon, M.D.
Bexley, Ohio
(1935-2016)
Member Since: 1972

THOMAS L. WACHTEL, M.D.

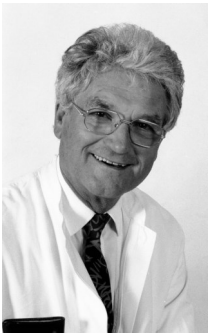


(1938–2018)

Dr. Wachtel was born on July 25, 1938, in Mansfield, Ohio. He received degrees from Case Western Reserve University, his medical degree from Saint Louis University, and his masters in medical management from Tulane University.
For more than 30 years, he was a senior trauma surgeon and medical director of trauma centers in San Diego (UCSD & Sharp), Denver, Phoenix, and Scottsdale. He has held prestigious leadership positions at medical organizations including the American Burn Association and the American Surgical Association. Dr. Wachtel was a Clinical Associate Professor of Surgery at the University of Arizona, and a retired Captain (USN) who served two tours in Vietnam and spent a total of 37 years in the service. He was also a writer who published two novels, Melt My Wings and Vietnam, I Love You, 22 chapters in medical books, and more than 165 published papers on trauma, burns, nutrition, and surgical education.
In 2008, Dr. Wachtel was in a car crash which left him a quadriplegic, but he retained his wit and a dedication to the family members around him.

He is survived by his loving wife, Carolyn; three children, John Wachtel DMD, David Wachtel and Julianne Wachtel-Bosch; three brothers (James, John, and Edward); and ten grandchildren.

LEONARD SCHWEIBERER, M.D.



(1930-2017)

Leonhard Schweiberer was married to Helgard Schweiberer, born Abel. From the marriage, the karateka and physician Birgit Schweiberer , the actor Thomas Schweiberer and another daughter emerged, also a physician.

As a member of the German alpine skiing national team , Schweiberer was among others 1956 Bavarian downhill champion .

Schweiberer completed a degree in human medicine at the Ludwig-Maximilians-University Munich (LMU), where he also obtained his doctorate. In 1960 he moved to the Surgical Clinic of the University Hospital of the Saarland in Homburg . There he habilitated, was appointed professor in 1976 and medical director of the department of trauma surgery , later acting director of the medical department. In 1981 he was appointed to the chair of the Surgical Clinic and Polyclinic of the Klinikum Innenstadt of the LMU Munich and held this position until 1999. In 1981 he was Senate President of the German Society of Traumatology. As a founding member of the working group emergency medication he helped the pre-hospital emergency medicine to a scientific basis. He was co-founder and initiator of the Institute for Emergency Medicine and Medicine Management at LMU.

Von Schweiberer developed a trauma score (severity I to III) for the exclusively descriptive classification of multiple injured emergency patients. Schweiberer, who was a member of Rotary-Club München-Mitte, wrote twelve books and monographs as well as more than 600 scientific papers. He was editor or co-editor of textbooks, journals and book series.

FREDERICK W. ACKROYD

(1930-2017)

Frederick W. Ackroyd died on February 12, 2017, at home, surrounded by family.

H. BRUCE WILLIAMS

(1929-2017)

It is with deep sadness that we announce the passing of Bruce Williams on March 24, 2017 at the age of 87 after a brief illness. He was predeceased, in 1997, by Dorothy, his loving wife of 40 years. He will be greatly missed by his sons Bruce (Beatrijs) and David (Bethany), his grandsons Martin, Patrick, Ryan, Andrew and Jason, and his loyal four- legged companion Daisy.

He will also be fondly remembered by his sister Violet Fellows, sister-in- law Edith Williams, and many relatives, friends, colleagues, students and patients. He was predeceased by his siblings James, Betty, Sidney and Fraser, and in-laws Robert, Margaret, Mary, Jack, Corum and Thomas from Harrisburg, North Carolina.

Born in Barney's River Nova Scotia, he completed his BA at Acadia University and graduated from Medical School at McGill University in 1955. Known for his work repairing congenital deformities and facial injuries in children, he also pioneered microvascular surgical techniques that improved the lives of thousands.

Emeritus Professor of Surgery at McGill University, he was the Chairman of McGill's Division of Plastic Surgery and Director of its Residency Program, and founded the burn unit at the Montreal General Hospital. He led numerous national and international medical organizations, and served as Surgeon-in-Chief of The Montreal Children's Hospital for 14 years. The recipient of many awards and distinctions, he was inducted into the Order of Canada in 2014.

An avid golfer, he was a member of the Royal Montreal Golf Club, Royal Poinciana (Naples, FL) and the Abenakee Club (Biddeford Pool, ME) and enjoyed playing rounds with his family and friends. Among other philanthropic endeavors, he co-founded the very successful Montreal Children's Hospital Foundation's Annual Golf Tournament in 1997 that supports research and excellence in pediatric care by attracting and retaining the best and brightest medical talent.

HENRY C. CLEVELAND, M.D

(1924-2016)

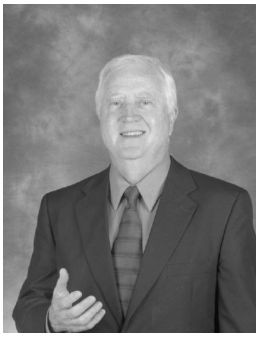
It is with deep sadness that we announce the passing of Bruce Williams on March 24, 2017 at the age of 87 after a brief illness. He was predeceased, in 1997, by Dorothy, his loving wife of 40 years. He will be greatly missed by his sons Bruce (Beatrijs) and David (Bethany), his grandsons Martin, Patrick, Ryan, Andrew and Jason, and his loyal four- legged companion Daisy.

He will also be fondly remembered by his sister Violet Fellows, sister-in-law Edith Williams, and many relatives, friends, colleagues, students and patients. He was predeceased by his siblings James, Betty, Sidney and Fraser, and in-laws Robert, Margaret, Mary, Jack, Corum and Thomas from Harrisburg, North Carolina.

Born in Barney's River Nova Scotia, he completed his BA at Acadia University and graduated from Medical School at McGill University in 1955. Known for his work repairing congenital deformities and facial injuries in children, he also pioneered microvascular surgical techniques that improved the lives of thousands.

Emeritus Professor of Surgery at McGill University, he was the Chairman of McGill's Division of Plastic Surgery and Director of its Residency Program, and founded the burn unit at the Montreal General Hospital. He led numerous national and international medical organizations, and served as Surgeon-in-Chief of The Montreal Children's Hospital for 14 years. The recipient of many awards and distinctions, he was inducted into the Order of Canada in 2014. An avid golfer, he was a member of the Royal Montreal Golf Club, Royal Poinciana (Naples, FL) and the Abenakee Club (Biddeford Pool, ME) and enjoyed playing rounds with his family and friends. Among other philanthropic endeavors, he co-founded the very successful Montreal Children's Hospital Foundation's Annual Golf Tournament in 1997 that supports research and excellence in pediatric care by attracting and retaining the best and brightest medical talent.

JOHN F. CONNOLLY, M.D.



(1936-2007)

Dr. John F. Connolly, respected orthopedic surgeon and educator, died unexpectedly at his home in Orlando, FL, on July 20, 2007, at the age of 71. He is remembered as a born educator and leader endowed with conviction and compassion, a mentor, friend, and healer. Born in Teaneck, NJ, on January 22, 1936, Connolly was a 1953 graduate of Regis High School in New York City. He graduated cum laude in 1957 from St. Peter's College in Jersey City, NJ, and earned his medical degree with AOA honors at the New Jersey College of Medicine (formerly Seton Hall) in 1961. He then completed surgical training in Seattle, New York and the University of Miami Jackson Memorial Hospital.

After two years service as a captain in the United States Air Force, he took a faculty position at Vanderbilt University (1968-1973), followed by a position at the University of Nebraska Medical Center (UNMC) where he conducted the bulk of his research career. Connolly's role at UNMC was pivotal in the development of a prominent residency program. In 1974, he joined the Department of Orthopedic Surgery and Rehabilitation as its first full-time chairman and built a nationally recognized orthopedic residency training program.

Although Dr. Connolly had broad academic interests, much of his research focused on the healing process of difficult fractures. He did pioneering work on bone marrow stem cells, including stimulating the bone marrow through biologic and electrical techniques to promote healing of cartilage and bone. Beyond his professional achievements, Connolly was also a devoted husband and father of six daughters, and deeply committed to his religious beliefs. He is survived by his loving wife of 43 years, Anne, and six daughters, Mari, Katie, Ednamarie, Jeanine, Anne McGrath and Claire. He was blessed by fifteen grandchildren at the time of his death.

CALVIN B. ERNST, M.D.

(1934–2015)

Calvin B. Ernst, MD, died in Lexington, Kentucky on July 7, 2015, barely a month after he had been diagnosed with an extremely aggressive renal angiosarcoma. He was born in 1934 in Detroit, Michigan, the only child of Edward and Irene Ernst. He attended the University of Michigan as an undergraduate, ran middle-distances on the track team, and met and married his wife, Elizabeth Abbott, in 1957. He attended the University of Michigan Medical School, graduating in 1959 cum laude and a member of AOA honorary. Following completion of his surgical residency at the University of Michigan, he became a faculty member at his alma matter for 6 years, interrupted by 2 years as a captain in the U.S. Army from 1966 to 1968 during the Vietnam Conflict, serving in a MASH unit during the Tet Offensive. In 1972, Ward Griffen recruited him to the University of Kentucky, where he became the Chief of Vascular Surgery until 1979. He was subsequently recruited by George Zuidema to the Johns Hopkins University, where he was the Chief of Surgical Services at the Baltimore City Hospitals until 1985. He then returned to Michigan and became the Chief of Vascular Surgery at the Henry Ford Hospital for 12 years, leaving to head up the Vascular Service for 3 years at the Allegheny University of the Health Sciences-MCP Hahnemann School of Medicine. He retired in 2001, continuing life as a serious cook, patient fisherman, and avid golfer.

Cal was a frequent contributor to the field of surgery, having authored more than 295 papers and textbook chapters, edited eight surgical textbooks including four editions of Current Therapy in Vascular Surgery, and presented more than 280 scientific papers in the United States and abroad. He served on the editorial boards of Surgery and the Archives of Surgery and was Editor of the Journal of Vascular Surgery from 1991 to 1996. He had been the president of a number of the more than two dozen learned societies that he was a member of, including the Southern Association of Vascular Surgery in 1982, the Frederick A. Coller Surgical Society in 1988, and the Society for Vascular Surgery in 1990. He was a Director of the American Board of Surgery from 1991 to 1997. Cal was a surgeon's surgeon and a legendary task master as an educator who taught by example. His intensity and drive was matched by his integrity and caring for his patients. Those who fell in his shadow were fortunate for the experience.

He was most recently a resident of Jupiter, Florida and East Orleans, Massachusetts. His wife Elizabeth passed away in 2011. He was the proud grandfather of six and is survived by his four children, Lisa, Matthew, David, and Susan, who were with him during his last days. He will be greatly missed by many patients and friends, including those of us who were his surgical colleagues.

ELMER R. MAURER, M.D.

Member Since: 1952

Winter Haven, Florida

DAVID YASHON, M.D.

(1935-2016)

Dr. David Yashon was born on May 13, 1935, in Chicago, Illinois, to Sam and Dorothy Yashon, immigrants from Ukraine and Poland respectively. David graduated from the University of Illinois with a M.Sc., in 1958. He attended the University of Illinois, receiving his Doctor of Medicine in 1960, remaining at the University of Illinois for his internship and residency in Neurosurgery and Neuropathology.

David started General Surgery at Presbyterian St. Luke's Hospital and then continued to have many appointments during his medical career in the Neurology Field of Medicine. David began his career as an Assistant in Neuroanatomy, (University of Illinois, 1960), Clinical Instructor in Neurosurgery (University of Chicago, 1965-1966), Associate Attending Neurosurgeon (Cook County Hospital, Chicago, Illinois, 1965-1966), Assistant Professor of Neurosurgery (Case Western Reserve University, Cleveland, Ohio, 1966-1969), Associate Professor of Neurosurgery (The Ohio State University, 1969-1974), and Professor of Neurosurgery (The Ohio State University, 1974). David retired in 2011 as Professor of Neurosurgery, Emeritus at The Ohio State University, Associate Neurosurgeon at Children's Hospital, Columbus, Ohio and Neurosurgeon at Central Ohio Neurological Surgeons, Westerville, Ohio. David was a member of the Hospital Staffs of Riverside Methodist Hospital, Doctor's Hospital (courtesy), Mount Carmel Hospitals (East and West), OSU East Hospital, and Grant/Riverside Hospital.


THE AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA
78th Annual Meeting
of AAST & Clinical Congress
of Acute Care Surgery
SAVE
THE DATE
September 18-21, 2019
Dallas, Texas

77th Annual Meeting of AAST and Clinical Congress of Acute Care Surgery
San Diego, CA September 26-29, 2018

TUE. 9/26/2018	FUNCTION	ROOM
11:00 AM – 7:00 PM	Registration	Manchester Lobby (1st)
1:00 PM – 5:00 PM	Presessions	See Ticket for Locations
6:30 PM – 9:30 PM	President's Reception/Dinner	Invite Only
WED. 9/27/2018	**FUNCTION**	**ROOM**
6:15 AM – 7:15 AM	International Breakfast *(registration required)*	Coronado DE (4th)
6:15 AM – 7:15 AM	Committee Meetings	Various Locations
6:30 AM – 5:30 PM	Registration	Seaport Foyer (2nd)
7:00 AM – 8:30 AM	Continental Breakfast	Seaport Foyer (2nd)
7:30 AM – 8:00 AM	Opening Session	Seaport D-H (2nd)
8:00 AM – 10:40 AM	Session I: Plenary Papers 1-8	Seaport D-H (2nd)
10:40 AM – 11:40 AM	Session II: WTC Panel I	Seaport D-H (2nd)
11:40 AM – 11:50 AM	Break	Seaport Foyer (2nd)
11:50 AM – 12:50 PM	Session III: Presidential Address, Michael F. Rotondo, MD	Seaport D-H (2nd)
1:00 PM – 2:15 PM	Session IV: AAST Lunch Sessions (6)	See Ticket for Locations
2:00 PM – 2:15 PM	Break	Seaport Foyer (2nd)
2:15 PM – 4:55 PM	Session V: Papers 9-16	Seaport D-H (2nd)
5:00 PM – 6:00 PM	Session VI: WTC Panel II	Seaport D-H (2nd)
5:00 PM – 7:30 PM	Exhibits Open	Harbor D-I (2nd)
6:00 PM – 7:30 PM	Session VII: AAST/WTC Posters	Harbor D-I (2nd)
6:30 PM – 10:00 PM	*Journal of Trauma & Acute Care Surgery* Editorial Board Meeting & Reception	Harbor D-I (2nd)
THURS. 9/27/2018	**FUNCTION**	**ROOM**
6:15 AM – 7:15 AM	Medical Student/Resident/In-Training Fellow Breakfast *(registration required)*	Coronado DE (4th)
6:15 AM – 7:15 AM	Committee Meetings	Various Locations
6:15 AM – 7:15 AM	Session VIII: WTC I Sessions	Various Locations
7:00 AM – 3:00 PM	Exhibits Open	Harbor D-I (2nd)
7:00 AM – 8:30 AM	Continental Breakfast in Exhibit Hall	Harbor D-I (2nd)
7:00 AM – 5:00 PM	Donor Lounge Open	Harbor Foyer (2nd)
7:30 AM – 8:50 AM	Session IX: Papers 17-20 Plenary session	Seaport D-H (2nd)
8:50 AM – 10:00 AM	Session X: AAST Panel	Seaport D-H (2nd)
10:00 AM – 10:30 AM	Session XI: Scholarship Presentations	Seaport D-H (2nd)
10:30 AM – 10:45 AM	Break in Exhibit Hall	Harbor D-I (2nd)
10:45 AM – 11:15 AM	Session XII: Master Surgeon Lecture: Ian Civil, MD	Seaport D-H (2nd)
11:15 AM – 12:15 PM	Session XIII: WTC Panel III	Seaport D-H (2nd)
12:15 PM – 1:30 PM	Lunch in Exhibit Hall/Break	Harbor D-I (2nd)
12:30 PM – 1:30 PM	Session XIV: WTC Power Sessions (9)	Various Locations
1:30 PM – 4:30 PM	Session XVA: Papers 21-29: Parallel Session	Seaport D-H (2nd)
1:30 PM – 4:30 PM	Session XVB: Papers 30-38: Basic Science	Seaport A-C (2nd)
4:45 PM – 5:45 PM	Session XVI: WTC II Sessions	Various Locations
6:30 PM – 9:30 PM	San Diego Night (*USS Midway*) – Optional	USS Midway
FRI. 9/16/2016	**FUNCTION**	**ROOM**
6:15 AM – 7:25 AM	Committee Meetings	Various Locations
6:15 AM – 7:15 AM	Session XVII: WTC III Sessions	Various Locations
7:00 AM – 8:30 AM	Continental Breakfast	Harbor D-I (2nd)
7:00 AM – 3:00 PM	Registration Open	Seaport Foyer (2nd)
7:00 AM – 2:00 PM	Exhibits Open	Harbor D-I (2nd)
7:00 AM – 4:00 PM	Donor Lounge Open	Harbor Foyer (2nd)
7:30 AM – 9:30 AM	Session XVIII: Papers 39-44	Seaport D-H (2nd)
9:30 AM – 9:45 AM	Break in Exhibit Hall	Harbor D-I (2nd)
9:45 AM – 10:45 AM	Session XIX: Papers 45-47	Seaport D-H (2nd)
10:55 AM – 11:55 AM	Session XX: Fitts Lecture: C. William Schwab, MD	Seaport D-H (2nd)
12:00 PM – 1:15 PM	Session XXI: AAST Lunch Sessions (6)	See Ticket for Locations
1:15 PM – 1:30 PM	Break in Exhibit Hall	Harbor D-I (2nd)
1:30 PM – 2:00 PM	Session XXII: Master Surgeon Lecture: Christine Gaarder, MD, PhD	Seaport D-H (2nd)
2:00 PM – 5:00 PM	Session XXIIIA: Papers 48-56	Seaport D-H (2nd)
2:00 PM – 5:00 PM	Session XXIIIB: Papers 57-65	Seaport A-C (2nd)
5:00 PM – 6:30 PM	AAST Business Meeting	Seaport A-C (2nd)
5:00 PM – 6:00 PM	Session XXIV: WTC IV Session	Various Locations
7:30 PM – 11:00 PM	Reception and Banquet	Seaport Foyer & D-H
SAT. 9/17/2016	**FUNCTION**	**ROOM**
7:00 AM – 10:00 AM	Registration *(If necessary)*	Seaport Foyer (2nd)
7:30 AM – 9:00 AM	Continental Breakfast	Seaport Foyer (2nd)
7:00 AM – 8:00 AM	New Member Breakfast	La Jolla (2nd)
8:00 AM – 9:00 AM	Session XXV: Papers 66-68: Plenary	Seaport A-C (2nd)
9:00 AM – 10:18 AM	Session XXVI: Quick Shot Session I: Papers 1-26	Seaport A-C (2nd)
12:00 PM – 2:00 PM	TSACO Editorial Board Meeting	La Jolla (2nd)