75th Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery

September 14 — September 17, 2016

HILTON WAIKOLOA VILLAGE

WAIKOLOA, HI

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*, initiated in 1961, and has approximately 1,300 members from 30 countries.

American Association for the Surgery of Trauma
(AAST)

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

- 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™

The American College of Surgeons designates this live activity for a maximum of **32.00** *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 **13.25** credits meet the requirements for Self-Assessment.

Of the *AMA PRA Category 1 Credits*™ listed above, a maximum of **3.00** credits may qualify as **Pediatric Trauma**.*

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

** 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
Accredited with Commendation by the
Accreditation Council for Continuing Medical Education

STATEMENT OF ATTENDANCE FORM
THE AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA
75th Annual Meeting of AAST and Clinical Congress of Acute Care Surgery
Hilton Waikoloa Village, Waikoloa, Hawaii, September 14-17, 2016

As a participant in this educational activity, indicate by marking (x) by each session you attended. To receive your CME certificate, follow the instructions below for completing the online evaluation. Carefully read the information below the chart for CME claiming instructions. **No paper forms will be accepted. The boxes below are for record-keeping purposes only. Claim credit for only the hours you attend.**

Tuesday, September 13, 2016 (total for day 2.0, 2.0 Self-Assessment Credit, 2.0 Pediatric Trauma Credit)

____ Pediatric Pre-Session (2.00)*

* *Self-Assessment is available*
** Pediatric Trauma Credit is available for this course also

WEDNESDAY, SEPTEMBER 14, 2016 (total for day 10.50, including 4 for Self-Assessment Credit)

____ Session I: Papers 1-9 (3)*
____ Session II: Presidential Address (1)
____ Lunch Sessions – pre-registration required (1)*
____ Session IIIA/B: Papers 10-19 or 20-29 (3.25)
____ Session IV: Master Surgeon Lecture (.5)
____ Session V: Poster Session (2)**
Please note: Posters 91-100 are eligible for Pediatric/Trauma Credits.

**Self-Assessment is available*
Lunch Sessions = Trauma/Critical Care Credit also
If you attended one of the six lunch sessions, check here: □

THURSDAY, SEPTEMBER 15, 2016 (total for day 7.75, including 3.25 Self-Assessment Credit)

____ Session VI: Papers 30-39 (3.25)*
____ Session VII: Scholarship Presentations (.50)
____ Session VIII: Fitts Lecture (1)
____ Optional Session: ANZAST/ATS (3.00)

**Self-Assessment is available*

FRIDAY, SEPTEMBER 16, 2016 (total for day 9.00, including 4 for Self-Assessment Credit)

____ Session IX: Papers 40-48 (3)*
____ Session X: Panel (1.25)
____ Lunch Sessions – pre-registration required (1)*
____ Session XIA/B: Papers 49-59 or 60-70 (3.75)

**Self-Assessment is available*
Lunch Sessions = Trauma/Critical Care Credit also
If you attended one of the six lunch sessions, check here: □

SATURDAY, SEPTEMBER 17, 2016 (total for day 2.75)

____ Session XII: Quick Shot Session I (1.25)
____ Session XII: Quick Shot Session II (1.50)

Total hours available: 32.00
Total Self-Assessment hours available: 13.25
Total Pediatric Trauma hours available: 3
Total Trauma/Critical Care hours available: 2

TOTAL CME HOURS CLAIMING:_____
TOTAL SELF-ASSESSMENT HOURS:_____
(To claim Self-Assessment Credit, you will be required to take tests for each session. The tests are located on the evaluation form.)
TOTAL PEDIATRIC TRAUMA HOURS:_____
TOTAL TRAUMA/CRITICAL CARE HOURS: _____

If you are a member of the American College of Surgeons, your completed CME information will be sent to "MY CME Portal Page" and will be updated with the credits within six (6) months of this activity. ACS ID #_____ - you will need this when completing the online evaluation.

ONLINE CME INFORMATION

All registered participants can obtain CME online only. To receive your CME for the 2016 Annual Meeting of AAST and Clinical Congress of Acute Care Surgery, please read over the instructions below. All CME forms must be completed within 30 days after the meeting (by October 14, 2016). *To be eligible for Self-Assessment Credit you MUST take AND pass the Self-Assessment Credit test within 10 days of the meeting (September 27, 2016).*

NEW IN 2016: Because each of the morning sessions (Wednesday, Thursday and Friday) are self-assessment, all attendees will receive an email each afternoon to take and pass your self-assessment tests. If you do not want self-assessment, you can fill out the number of hours each day or wait until the final day.

On Saturday a final email will be sent and you **MUST** take the evaluation form and finalize your CME to actually receive credit.

A CME information area will be near the AAST information desk for questions. Please ask for Bridget Lindbloom.

If you are an AAST Member and used the same email address in the AAST membership system to register for the meeting, your information is already in the AAST. To claim CME credit please click on the red box near your name at the top OR the pale yellow box above "For Members" on the right hand side. You must be logged in to see either of these items.

If you are not an AAST member, but have attended a previous meeting and claimed CME OR created an account on www.aast.org and used the same email address to register, you can claim CME by logging in using the account you created at www.aast.org and clicking on the "log in" button on the top right hand corner.

If you are not an AAST member and have not created an account, an account has been created for you. You will need to go to www.aast.org and click on the "log in" button on the top right. Your username is your email address. Click the "forgot your password" to receive a password to log in. Once you log in you will see a red box near your name or a pale yellow box above "For Members"

Disclosure Information

75th Annual Meeting of AAST and Clinical Congress of Acute Care Surgery

September 14-17, 2016

Waikoloa, HI

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
A. Peter Ekeh	No			
Aaron Marcos Strumwasser	No			
Adil Haider	No			
Adrian Anthony Maung	No			
Ahmed F Khouqeer	No			
Aimee Hymel	No			
Aisha Shaheen	No			
Ajai Kumar Malhotra	No			
Ajai Malhotra, MD, MSc, MBBS	No			
Alberto Federico Garcia	No			
Alexander Eastman	Yes - Lunch Session 4	Z Medica	Speaker	Travel Reimburse-ment
Alexander Eastman, MD	No			
Alexander St. John	No			
Alexis Smith	No			
Ali Salim, MD	No			
Amanda Teichman	No			
Amin Madani	No			

Presenter	Nothing To Disclose	Disclosure		
		Company	Role	Received
Amy Goldberg, MD	No			
Amy Mei Yee Kwok	No			
Andre Campbell, MD	No			
Andrea L Lubitz	Yes - Paper 4	Ikaria/ Mallinckrodt	Academic Research	Grant Funding For Partial Support Of The Project
Andrea L Lubitz	Yes - Paper 4	Department Of Defense/Office Of Naval Research	Academic Research	Grant Funding For Partial Support Of The Project
Andrea Michelle Long	No			
Andrew B Peitzman	No			
Andrew Doben, MD	No			
Andrew J Kerwin	No			
Andrew Kerwin, MD	No			
Andrew W Kirkpatrick	Yes - QuickShot 18	Canadian Forces Medical Services	Members Of The Canadian Forces	Salary, Cost of the Falcon 20 Aircraft
Andrew W Kirkpatrick	Yes - QuickShot 18	Canadian Forces Medical Services	Employment	Salary
Andrew W Kirkpatrick	Yes - QuickShot 18	Strategic Operations	Management Position	Donation Of Use Of The Cut-Suit And Suppplies
Angela Sauaia	No			
Anna Romagnoli	No			
Anna Sharrock	Yes - Poster 41	Royal Centre For Defence Medicine	Employment	Crown Copyright to be Retained
Annika Bickford Kay	No			
Ansab A Haider	No			
Anupamaa Seshadri	No			
Ara Ko	No			
Arturo J Rios-Diaz	No			
Ashley Beecher	No			
Ashley D Meagher	No			
Atsushi Shiraishi	Yes - Poster 87	Sanofi K.K.	Speaker	Honoraria
Atsushi Shiraishi	Yes - Poster 87	Chugai Pharmaceutical Co., Ltd.; Nobelpharma Co., Ltd.	Speaker	Honoraria
Avery Nathens, MD, MPH, PhD	No			
Awais Ashfaq	No			
Barbara A. Gaines	No			
Bellal Joseph	No			

Presenter	Nothing To Disclose	Disclosure		
		Company	Role	Received
Ben L Zarzaur	No			
Benjamin Reeves Martinez	No			
Brandon Fumanti	No			
Brandon R Bruns	No			
Brenda Marie Zosa	No			
Brian E Leininger MD	No			
Brian William Gross	No			
Bryan C Morse	No			
Bryce Robinson	No			
Carl J. Hauser MD	No			
Carlos Brown, MD	No			
Carrie Sims	No			
Cathline J Layba	No			
Cathy A. Maxwell	No			
Chad B Walton	Yes - Poster 102	University Of Hawaii	Employment	Intellectual Property Rights
Charles A Adams, MD	No			
Charles A Karcutskie	No			
Charles Patrick Shahan	No			
Charles Wade	Yes - Paper 36	Decisio	Inventor	Ownership Interest
Cheryl K Zogg	No			
Christine Gaarder	No			
Christine M Leeper	No			
Christopher Dente	No			
Christopher Wistrom	No			
Cino Bendinelli	No			
Claudia Patricia Lozano	No			
Clay Cothren Burlew	No			
Col. Todd Rasmussen	No			
Cornelius A Thiels	No			
Cornelius Thiels, DO	No			
Corrine Blumling	No			
Daniel D. Yeh, MD	Yes – Quick Shot 14	Nestle	Grant	PI
Daniel D. Yeh, MD	Yes – Quick Shot 14	Smith & Nephew	Grant	PI
Daniel D. Yeh, MD	Yes – Quick Shot 14	Kenetic Concepts Inc	Grant	PI
Daniel D. Yeh, MD	Yes – Quick Shot 14	Covidien	Consultant	Honoraria
Daniel D. Yeh, MD	Yes – Quick Shot 14	UpToDate	Author	Royalties
Daniel Eiferman	No			
Daniel Galanis	No			
Daniel James McIlroy	No			

Presenter	Nothing To Disclose	Disclosure		
		Company	Role	Received
Danielle Barnard	No			
David B. Hoyt, MD, FACS	No			
David Feliciano	No			
David Gomez	No			
David Harrington, MD	No			
David J Ciesla	No			
David Livingston, MD	No			
David Notrica, MD, FACS, FAAP	No			
David S. Inouye	No			
David Spain, MD	No			
David V. Feliciano MD	No			
Deborah A. Kuhls	No			
Deborah Stein, MD, MPH	No			
Demetrios Demetriades	No			
Denis Bensard	No			
Dennis Yong Kim	No			
Donald H. Jenkins, MD, FACS	No			
Duraid Younan	No			
E.E. Moore	Yes - Lunch Session 3	Haemonetics, TEM	Principle Investigator	Research Support
Edward E. Cornwell, MD	No			
Eileen Bulger	No			
Elizabeth Benjamin	No			
Elizabeth Frederick	Yes - Poster 30	Ampio Pharmaceut-icals	Employment	Intellectual Property Rights
Elizabeth Frederick	Yes - Poster 30	Ampio Pharmaceut-icals	Board Member	Salary, Ownership Interest
Elizabeth L Beste	No			
Elizabeth M Windell	No			
Emily EK Murphy	No			
Emily J. MacKay	No			
Eric Ley, MD	No			
Eric N Klein	No			
Eric S Weiss	No			
Eric Voiglio, MD, PhD	No			
Erika Gonzalez Rodriguez	No			
Erika M. Priestley	No			
Erin C. Hall	No			
Eszter Tuboly	No			
Eugene Wang	No			
Eyad Issa	No			
Frank Butler, MD	No			

Presenter	Nothing To Disclose	Disclosure		
		Company	Role	Received
Fred Luchette	No			
Frederick Rogers	No			
Gabrielle Briggs	No			
Gail Tominaga, MD	No			
Garth Utter, MD	No			
Gene Alan Grindlinger	No			
George Black	No			
George Milum Testerman	No			
Georgina Alizo	No			
Gerald Fortuna	No			
Goro Tajima	No			
Grace S. Rozycki, MD, MBA	No			
Graeme Michael Rosenberg	No			
Grant O'Keefe, MD, MPH	No			
Grant Vincent Bochicchio	No			
Greg Hambright	No			
Gregory J Jurkovich	No			
Gregory P Victorino	No			
Gregory Thomas	Yes - Poster 56	Ampio Pharmaceut-icals	Employment	Salary, Ownership Interest
Gretchen Thomsen	No			
Hans-Christoph Pape, MD	No			
Heather Evans	No			
Herbert A. Phelan, MD	No			
Hunter Burroughs Moore	No			
Ian Civil, MBE	No			
Ian Elliott Brown	No			
Indermeet Bhullar, MD	No			
Ines Gloria Alamo	No			
J M Gurney	No			
J. Wayne Meredith	No			
Jack C He	No			
James Betts, MD	No			
James C Becker	No			
James D Wallace	No			
James O'Connor	No			
James P Byrne	No			
James W. Davis	No			
Jamie Jones Coleman	No			
Jan-Michael Van Gent	No			
Jason Hoth	No			
Jason Lees, MD	No			

Presenter	Nothing To Disclose	Disclosure		
		Company	Role	Received
Jason Smith	No			
Jason Sperry, MD, MPH	No			
Jason W. Smith MD PhD	No			
Jay Collins	No			
Jay Doucet	No			
Jay Menaker	No			
Jeffrey F Barletta	No			
Jeffrey Salomone	No			
Jeffry Todd Nahmias	No			
Jennifer Brooke Hale	No			
Jennifer Gurney	No			
Jennifer L Hartwell	No			
Jennifer M. Leonard	No			
Jeremy W. Cannon	No			
Jerrold H Levy	Yes - Poster 11	Boehringer Ingelheim, CSL Behring, Janssen, Girfols, MedCo Health Solutions, Pfizer	Consultant, Steering Committee	Honoraria
Jessica H Beard	No			
Joan Pirrung	No			
Joelle Getrajdman	No			
John Andrew Harvin	No			
John Fildes	No			
John Holcomb, MD	No			
John Keneddy Bini, MD, FACS	No			
John P Sharpe	No			
John W Scott	No			
John Yonge	No			
Jon David Simmons	No			
Jon Perlstein, MD	No			
Jonathan Tilsed, MD	No			
Jordan A Weinberg	No			
Jose Diaz, MD	No			
Joseph M Galante	No			
Joseph Minei, MD, MBA	Yes	Atox-Bio, Irrimax	Site PI	Grant Support
Joshua B Brown	No			
Joshua S Bowler	No			
Juan Asensio, MD	No			
Juan Carlos Duchesne	No			
Junya Tsurukiri	No			

Presenter	Nothing To Disclose	Disclosure		
		Company	Role	Received
Justin J.J. Watson	No			
Kai Wang	No			
Kaori Ito	No			
Karalyn Bentley-Kumar	No			
Kareem Ibraheem	No			
Karen Brasel, MD, MPH	No			
Kate Louise King	No			
Keith R Miller	No			
Kelly A. Fair, MD	No			
Kenji Inaba	No			
Kevin M. Schuster	No			
Kevin W Sexton	No			
Kiavash R Koko	No			
Kimberly Davis, MD, MBA	No			
Kirby Gross MD FACS	No			
Kiyoshi Itagaki	No			
Kristan Staudenmayer	No			
Kristin Salottolo	No			
L.D. Britt, MD, MPH	No			
Laura Moore, MD	Yes - Poster Session IV	Decisio Health	Founding Member, Shareholder	Ownership Interest
Laura Nadine Godat	No			
Lawrence N Diebel	No			
Leah Carey Tatebe	No			
Leasha Janece Schaub	No			
Lena Napolitano	No			
Lenworth Jacobs, MD, MPH	No			
Leslie M Kobayashi	No			
Lewis Kaplan	No			
Lindsay Jones Talbot	No			
Lindsey L Perea	No			
Lori A Gurien	No			
Louis Magnotti	No			
Lt Col Jennifer Hatzfeld	No			
Luke PH Leenen	No			
M. Margaret Knudson, MD	No			
Madhu Subramanian	No			
Marc D Trust	No			
Marc de Moya	No			
Maria E Linnaus	No			
Marie Crandall	No			
Mark A. Malangoni MD	No			

Presenter	Nothing To Disclose	Disclosure		
		Company	Role	Received
Mark R. Hemmila	No			
Mark Seamon, MD FACS	No			
Mark Shapiro, MD	No			
Marko Bukur	Yes - Poster 132	BiO2	Independent Contractor	Salary
Marquinn Duke	No			
Martin A. Croce	No			
Martin Croce, MD	No			
Martin Schreiber	No			
Matthew B. Bloom	No			
Matthew Benns	No			
Matthew Hernandez	No			
Matthew L Leatherman	No			
Matthew Martin, MD	No			
Matthew P Rowan	No			
Matthew Reza Noorbakhsh	No			
Matthias Fröhlich	No			
Mazhar Khalil	No			
Megan Brenner	No			
Mehreen Kisat	No			
Melissa Ann Hausburg	Yes - Poster 37	Ampio Pharmaceut-icals	Employment	Salary, Ownership Interest
Melissa Ann Hausburg	Yes - Poster 37	Ampio Pharmaceut-icals	Management Position, Board Member	Salary, Intellectual Property Rights, Ownership Interest
Melissa N Loja	No			
Micaela M Esquivel	No			
Michael A Dubick	No			
Michael Dubick, MD	No			
Michael F. Rotondo, MD	No			
Michael Johnson	No			
Michael Sise, MD	No			
Michael W. Wandling	No			
Micheal Stiefel	No			
Michel Aboutanos, MD, MPH	No			
Michelle H Scerbo	No			
Miklosh Bala	No			
Mitchell Cohen	No			
Mitsuaki Kojima	No			
Mitsunori Ikeda	No			
Nalin Chokengarmwong	No			

Presenter	Nothing To Disclose	Disclosure		
		Company	Role	Received
Nathan Mowery, MD	No			
Nicholas Namias	No			
Nicholus Michael Warstadt	No			
Nickolas Byrge	No			
Nicole Stassen, MD	No			
Nina Neuhaus	No			
Nobuichiro Tamura	No			
Nobuyuki Saito	No			
Oliver Gunter, MD	No			
Orlando Kirton	No			
Oscar D. Guillamondegui	No			
Pamela Daher	No			
Patrick Langdon Bosarge	No			
Patrick Murphy	No			
Patrick Reilly, MD	No			
Paul Bradley McBeth	No			
Paul R Lewis	No			
Paul Vulliamy	No			
Paula Ferrada	No			
Peter Rhee	No			
R. Todd Maxson	No			
Rachael A Callcut	No			
Rachel Landisch	No			
Rajesh R. Ghandi	No			
Rami Ahmd Namas	No			
Raminder Nirula, MD, PhD	No			
Randeep S Jawa	No			
Randi Leigh Sessoms Lassiter	Yes - Poster 71	Questcor Pharmaceut-icals, Inc.	Research Fellow	Grant
Raul Coimbra, MD, PhD	No			
Raymond Fang, MD	No			
Rebecca F Brown	No			
Rebecka Ahl	No			
Richard Miller, MD	No			
Richard Yee Calvo	No			
Robert Barraco, MD, MPH	No			
Robert David Becher	No			
Robert J. WInchell	No			
Robert Mackersie	No			
Rochelle Dicker, MD	No			
Rodrigo F. Alban	No			
Ronald I. Gross	No			

Presenter	Nothing To Disclose	Disclosure		
		Company	Role	Received
Ronald M. Stewart, MD	No			
Ronald V. Maier	No			
Rondi Beth Gelbard	No			
Rosemary Kozar	No			
Roxie Albrechts, MD	No			
Russell Dumire	No			
Sam Arbabi, MD, MPH	No			
Samir M Fakhry	No			
Sammy S Siada	No			
Sandro Rizoli	Yes - Lunch Session 5	TEM International, CSL Behring	Chair consensus committee, chair consensus conference	Unrestricted educational grant
Sarah Lombardo	No			
Sarah Majercik, MD, MBA	No			
Scott Brakenridge	No			
Scott Dolejs	No			
Scott Matthew Moore	No			
Sebastian D Schubl	No			
Seda Bourikian, MD	No			
Shahid Shafi, MD	No			
Shahram Aarabi	No			
Shannon Beierle	No			
Sharon Henry, MD	No			
Shawna Marie Kettyle	No			
Simone Langness	No			
Sonlee West	No			
Stephanie A Savage	No			
Stephen C Gale	No			
Steven Johnson, MD	No			
Steven R. Shackford	No			
Steven Spencer	No			
Sudha Jayaraman	No			
Susan E Rowell	No			
Susan Evans	No			
Susannah Elizabeth Nicholson	No			
Swathi B Reddy	No			
Tabitha Garwe	No			
Taichiro Tsunoyama	No			
Tarsicio Uribe-Leitz	No			
Terri Ann DeRoon-Cassini	No			
Thomas Santora, MD	No			

Presenter	Nothing To Disclose	Disclosure		
		Company	Role	Received
Thomas Scalea, MD	No			
Timothy Browder, MD, MPH	No			
Timothy Fabian	No			
Timothy K Williams	No			
Tina Palmieri	No			
Todd W Costantini	No			
Tom Scalea	No			
Tomohiko Orita	No			
Tracy Evans	No			
Tuan Dinh Le	No			
Vaidehi Agrawal	No			
Walter L Biffl, MD	No			
Warren Dorlac	No			
Weidun Alan Guo	No			
Wen Hui Tan	No			
Wen-yuan Wang	No			
William Cioffi	No			
Yasuhiro OTOMO	No			
Yutaka Umemura	No			
Zara Cooper	No			
Zoe Maher	No			
Zsolt J. Balogh, MD, PhD	No			
Planning Committee				
Ben L. Zarzaur, MD, MPH	No			
Col. Todd Rasmussen	No			
David Harrington	No			
David Spain	No			
Ellen Bulger	Yes	Atox Bio, Arsenal Inc., New Health Sciences	Consultant	Consulting Income
Ernest E Moore	Yes	Haemonetics and TEM		Research Support
Grace S. Rozycki, MD, MBA	No			
John Holcomb	No			
Kimberly Davis, MD, MBA	No			
Martin A. Croce	No			
Orlando C Kirton	No			
Raul Coimbra, MD, PhD, FACS	No			
Timothy C. Fabian, MD	No			

SCHEDULE

(TAB #1)

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SCHEDULE

(TAB #1)

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SEVENTY-FIFTH ANNUAL MEETING
OF THE
AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA
AND
CLINICAL CONGRESS OF ACUTE CARE SURGERY
SEPTEMBER 14-17, 2016
HILTON WAIKOLOA VILLAGE
WAIKOLOA, HAWAII

GENERAL AND SCIENTIFIC PROGRAM SCHEDULE

Tuesday, September 13, 2016

7:30 am - 4:30 pm	**AAST BOARD OF MANAGERS MEETING**
2:00 - 7:00 pm	**REGISTRATION** Location: Grand Promenade
5:00 – 7:00 pm	**PEDIATRIC PRE-SESSION** Location: Kohala 3 & 4

Wednesday, September 14, 2016

6:15 – 7:25 am	**COMMITTEE MEETINGS** Military Liaison Committee Location: Kona 2 & 3 Patient Assessment Committee Location: Kohala 3 Research and Education Fund Committee Location: Kona 1
6:30 - 7:30 am	**MEDICAL STUDENT/RESIDENT/IN-TRAINING FELLOW BREAKFAST** Location: Kohala 1 *Trauma – A Global Disease* Presiding: Raul Coimbra, MD, PhD *(Ticketed Event)*
6:30 - 7:30 am	**INDUSTRY SATELLITE SYMPOSIUM** Location: Kohala 2
6:30 am – 5:30 pm	**REGISTRATION** Location: Grand Promenade

7:00 – 8:30 am	**BREAKFAST** Location: Grand Promenade/Kona Foyer
7:00 am – 5:30 pm	**EXHIBITS OPEN** Location: Grand Promenade/Kona Foyer
7:30 - 7:50 am	**WELCOME** Location: Grand Ballroom Presiding: Grace Rozycki, MD, MBA
7:50 – 10:50 am	**SESSION I: PLENARY PAPERS 1-9** Location: Grand Ballroom Moderator: Raul Coimbra, MD, PhD Recorder: David Spain, MD
7:50 am Paper #1	OPTIMIZATION BRAIN METABOLISM USING METABOLIC-TARGETED HYPOTHERMIA THERAPY CAN REDUCE MORTALITY OF TRAUMATIC BRAIN INJURY Presenter: Wen-yuan Wang, MBBS Discussant: Daniel Eiferman, MD
8:10 am Paper #2	STAPLED VS HANDSEWN: A PROSPECTIVE EMERGENCY SURGERY STUDY (SHAPES) Presenter: Brandon Bruns, MD Discussant: Gregory Jurkovich, MD
8:30 am Paper #3	"WeBET" THAT WEIGHT BASED ENOXAPARIN DOSING DECREASES DVT IN HOSPITALIZED TRAUMA PATIENTS: A RANDOMIZED, CONTROL, DOUBLE BLIND TRIAL Presenter: Annika Kay, PA-C Discussant: Gerald Fortuna, Jr., MD
8:50 am Paper #4	ACUTE RIGHT HEART FAILURE AFTER TRAUMA PNEUMONECTOMY – IS IT PREVENTABLE?: A BLINDED RANDOMIZED CONTROLLED ANIMAL TRIAL USING INHALED NITRIC OXIDE (iNO) Presenter: Andrea Lubitz, MD Discussant: James O'Connor, MD

9:10 am Paper #5	EFFICACY OF LOW MOLECULAR WEIGHT HEPARIN VS UNFRACTIONATED HEPARIN TO PREVENT PULMONARY EMBOLISM FOLLOWING MAJOR TRAUMA: RESULTS FROM THE AMERICAN COLLEGE OF SURGEONS TRAUMA QUALITY IMPROVEMENT PROGRAM Presenter: James Byrne, MD Discussant: Steven Shackford, MD
9:30 am Paper #6	SURVEY OF THE AMERICAN COLLEGE OF SURGEONS COMMITTEE ON TRAUMA MEMBERSHIP ON FIREARM INJURY: CONSENSUS AND OPPORTUNITIES Presenter: Deborah Kuhls, MD Discussant: Ernest Moore, MD
9:50 am Paper #7	AN AAST-MITC ANALYSIS OF PANCREATIC TRAUMA: STAPLE OR SEW? RESECT OR DRAIN? Presenter: Nickolas Byrge, MD Discussant: Timothy Fabian, MD
10:10 am Paper #8	POTENTIAL IMPACT OF ACA-RELATED INSURANCE EXPANSION ON TRAUMA CARE REIMBURSEMENT: COULD IT BE MORE THAN A BILLION DOLLARS? Presenter: John Scott, MD, MPH Discussant: L.D. Britt, MD, MPH
10:30 am Paper #9	PLATELET TRANSFUSIONS IN STANDARD DOSES DO NOT PREVENT LOSS OF PLATELET FUNCTION DURING HAEMORRHAGE Presenter: Paul Vulliamy, MD Discussant: John Holcomb, MD
10:50 – 11:00 am	**BREAK** Location: Grand Promenade/Kona Foyer
11:00 am – 12:00 pm	**SESSION II: PRESIDENTIAL ADDRESS** Location: Grand Ballroom Introduction: Raul Coimbra, MD, PhD *A Legacy of Caring* Grace Rozycki, MD, MBA

12:00 - 1:15 pm	Lunch Sessions
Lunch Session I	The Role of the Rescue Surgeon - What to do when you are called for intraoperative Bleeding Moderator: Christopher Dente, MD Presenters: Stephanie Savage, MD, and Andrew Peitzman, MD
Lunch Session II	REBOA Debate: Essential or Dangerous? Moderator: L.D. Britt, MD, MPH Presenters: Essential: Lena Napolitano, MD, MPH Dangerous: Matthew Martin, MD
Lunch Session III	Why do my manuscripts get rejected? Moderator: Steven R. Shackford, MD Presenters: Ernest Moore, MD, and Angela Sauaia, MD, PhD
Lunch Session IV	Translating Point of Injury Lessons Learned for Theater to the Civilian Experience Moderator: Kirby Gross, MD Presenters: Raymond Fang, MD, Mark Seamon, MD, Alexander Eastman, MD, MPH, and Frank Butler, MD
Lunch Session V	Beyond Damage Control - Thrombeolastography in the ICU Moderator: Deborah Stein, MD, MPH Presenters: Mitchell Cohen, MD, Laura Moore, MD, and Sandro Rizoli, MD
Lunch Session VI	Current Surgical Management of Complicated Pancreatitis Moderator: Nicole Stassen, MD Presenters: Oliver Gunter, MD and Nathan Mowery, MD

1:15 - 4:35 pm		SESSION IIIA: PAPERS 10-19
		Location: Grand Ballroom Moderator: Edward Cornwell, III, MD Recorder: Patrick Reilly, MD
1:15 pm	Paper #10	RESULTS OF A MULTICENTER PROSPECTIVE PIVOTAL TRIAL OF THE FIRST IN LINE CONTINUOUS GLUCOSE MONITOR IN CRITICALLY ILL PATIENTS Presenter: Grant Bochicchio, MD, MPH Discussant: Dennis Kim, MD
1:35 pm	Paper #11	FIBRINOLYTIC ACTIVATION IN PATIENTS WITH PROGRESSIVE INTRACRANIAL HEMORRHAGE EARLY AFTER TBI Presenter: Kelly Fair, MD Discussant: Mitchell Cohen, MD
1:55 pm	Paper #12	REDEFINING THE CARDIAC BOX: EVALUATION OF THE RELATIONSHIP BETWEEN THORACIC GUNSHOT WOUNDS AND CARDIAC INJURY Presenter: Bryan Morse, MD, MS Discussant: Nicholas Namias, MD, MBA
2:15 pm	Paper #13	NON-HUMAN PRIMATE (NHP) MODEL OF POLY-TRAUMATIC HEMORRHAGIC SHOCK RECAPITULATES EARLY PLATELET DYSFUNCTION OBSERVED FOLLOWING SEVERE INJURY IN HUMANS Presenter: Leasha Schaub, MS Discussant: Weidun Guo, MD, PhD
2:35 pm	Paper #14	AUTOMATED VARIABLE AORTIC CONTROL VS. COMPLETE AORTIC OCCLUSION IN A SWINE MODEL OF HEMORRHAGE Presenter: Timothy Williams, MD Discussant: Thomas Scalea, MD
2:55 pm	Paper #15	LONG-TERM OUTCOMES OF THORACIC ENDOVASCULAR AORTIC REPAIR (TEVAR): A SINGLE INSTITUTION'S 11-YEAR EXPERIENCE Presenter: Megan Brenner, MD, MS Discussant: Demetrios Demetriades, MD, PhD

3:15 pm	Paper #16	POTENTIAL CONTRIBUTION OF MITOCHONDRIAL (MT) DNA DAMAGE ASSOCIATED MOLECULAR PATTERNS (DAMPS) IN TRANSFUSION PRODUCTS TO DEVELOPMENT OF THE ACUTE RESPIRATORY DISTRESS SYNDROME (ARDS) AFTER MULTIPLE TRANSFUSIONS Presenter: Jon Simmons, MD Discussant: Carl Hauser, MD
3:35 pm	Paper #17	LONGITUDINAL ANALYSIS OF CIRCULATING MITOCHONDRIAL DNA AS A BIOMARKER IN PATIENTS WITH SYSTEMIC INFLAMMATORY RESPONSE SYNDROME Presenter: Mehreen Kisat, MD Discussant: Lawrence Diebel, MD
3:55 pm	Paper #18	HEMORRHAGIC SHOCK DEPLETES AVP STORES AND HORMONAL SUPPLEMENTATION PRESERVES MITOCHONDRIAL FUNCTION Presenter: Carrie Sims, MD Discussant: Jason Smith, MD
4:15 pm	Paper #19	SYSTEMIC ANTICOAGULATION IN THE SETTING OF VASCULAR EXTREMITY TRAUMA Presenter: Joseph Galante, MD Discussant: David Feliciano, MD

1:15 - 4:35 pm		SESSION IIIB: PAPERS 20-29
		Location: Kona 4 & 5 Moderator: Michael Rotondo, MD Recorder: Karen Brasel, MD, MPH
1:15 pm	Paper #20	RESULTS OF A REGIONAL COLLABORATIVE QUALITY INITIATIVE FOR TRAUMA Presenter: Mark Hemmila, MD Discussant: Oscar Guillamondegui, MD, MPH
1:35 pm	Paper #21	NEURO-, TRAUMA-, OR MED/SURG-ICU: DOES IT MATTER WHERE POLYTRAUMA PATIENTS WITH TBI ARE ADMITTED? SECONDARY ANALYSIS OF THE AAST-MITC DECOMPRESSIVE CRANIECTOMY STUDY. Presenter: Sarah Lombardo, MD Discussant: Jennifer Gurney, MD
1:55 pm	Paper #22	THE TRAUMA ECOSYSTEM: THE ECONOMICS AND IMPACT OF NEW TRAUMA CENTERS ON EXISTING CENTERS Presenter: David Ciesla, MD Discussant: Robert Winchell, MD
2:15 pm	Paper #23	THE AIR MEDICAL PREHOSPITAL TRIAGE SCORE: EXTERNAL VALIDATION SUPPORTS ABILITY TO IDENTIFY INJURED PATIENTS THAT WOULD BENEFIT FROM HELICOPTER TRANSPORT Presenter: Joshua Brown, MD, MSc Discussant: Jay Doucet, MD, MSc
2:35 pm	Paper #24	ACS NEEDS BASED ASSESSMENT OF TRAUMA SYSTEMS (NBATS) TOOL: CALIFORNIA EXAMPLE Presenter: Tarsicio Uribe-Leitz, MD, MPH Discussant: Michael Rotondo, MD

2:55 pm	Paper #25	COMPLIANCE WITH TRIAGE DIRECTIONS FROM AN ORGANIZED STATE TRAUMA COMMUNICATION CENTER IMPROVES TRAUMA PATIENT OUTCOMES Presenter: Benjamin Martinez, MD Discussant: Robert Mackersie, MD
3:15 pm	Paper #26	ACS LEVEL I TRAUMA CENTERS OUTCOMES DO NOT CORRELATE WITH PATIENT PERCEPTIONS OF HOSPITAL EXPERIENCE Presenter: Bellal Joseph, MD Discussant: Frederick Rogers, MD
3:35 pm	Paper #27	ATTEMPTING TO VALIDATE THE OVER/UNDER TRIAGE MATRIX AT A LEVEL I TRAUMA CENTER Presenter: James Davis, MD Discussant: Eileen Bulger, MD
3:55 pm	Paper #28	SUICIDE SECONDARY TO FIREARMS: WEAKER GUN STATE LAWS ARE ASSOCIATED WITH INCREASED RATES OF DEATH Presenter: Rodrigo Alban, MD Discussant: Ronald Gross, MD
4:15 pm	Paper #29	UTILITY OF THE INJURED TRAUMA SURVIVOR SCREEN TO PREDICT PTSD AND DEPRESSION IN HOSPITALIZED TRAUMA PATIENTS Presenter: Terri DeRoon-Cassini, PhD Discussant: Ronald Stewart, MD

4:45 – 5:15 pm	**SESSION IV: MASTER SURGEON** Location: Grand Ballroom *NIH P-50 Sponsored Team Science in Multiple Organ Failure* Frederick Moore, MD

5:15 – 7:00 pm **SESSION V: POSTER SESSION**

Location: Grand Promenade (& Lagoon Lani)

Poster	Category	Professors
1-10	Abdominal Trauma and Burns	David Harrington, MD and Mark Shapiro, MD
11-20	Acute Care Surgery	Matthew Martin, MD, and Charles Adams, Jr., MD
21-30	Acute Care Surgery and Critical Care	Eric Ley, MD and Sarah Majercik, MD, MBA
31-40	Critical Care	Ajai Malhotra, MD, M.Sc, MBBS and Laura Moore, MD
41-50	Extremity and Vascular	Jonathan Tilsed, MD and Donald Jenkins, MD
51-60	Neurotrauma	Deborah Stein, MD, MPH and Jason Sperry, MD, MPH
61-70	Outcomes & Guidelines I	Robert Barraco, MD, MPH and Hans-Christoph Pape, MD
71-80	Outcomes & Guidelines II	Avery Nathens, MD, MPH, PhD and Shahid Shafi, MD
81-90	Outcomes & Guidelines III and Shock	Andrew Kerwin, MD and Andre Campbell, MD
91-100	Pediatric Trauma	Barbara Gaines, MD and James Betts, MD
101-110	Shock	Amy Goldberg, MD and Timothy Browder, MD, MPH
111-120	Socioeconomics, Ethics & Thoracic	Roxie Albrecht, MD and Richard Miller, MD
121-130	Trauma Education and Prevention	Rochelle Dicker, MD and Joan Pirrung, RN, MSN
131-140	Trauma Systems	Eric Voiglio, MD, PhD and Garth Utter, MD

Thursday, September 15, 2016

6:15 – 7:25 am **COMMITTEE MEETINGS**

Acute Care Surgery Committee Meeting	Kona 1
Critical Care Committee Meeting	Kona 2 & 3
Disaster Ad Hoc Committee Meeting	Kohala 1
International Relations Committee Meeting	Kohala 2
Multi-Institutional Trials Committee Meeting	Kohala 3
Prevention Committee Meeting	Kohala 4
Reimbursement/Coding Committee	Kona 4 & 5

7:00 – 8:30 am **BREAKFAST**
Location: Grand Promenade/Kona Foyer

7:00 am – 1:00 pm **EXHIBITS**
Location: Grand Promenade/Kona Foyer

7:00 am – 12:30 pm **REGISTRATION**
Location: Grand Promenade

7:30 - 10:50 am **SESSION VI: PLENARY PAPERS 30-39**
Location: Grand Ballroom
Moderator: Grace Rozycki, MD, MBA
Recorder: David Spain, MD

7:30 am Paper #30 EXOSOMES, NOT PROTEIN OR LIPIDS, IN MESENTERIC LYMPH ACTIVATE INFLAMMATION: UNLOCKING THE MYSTERY OF POST-SHOCK MULTIPLE ORGAN FAILURE
Presenter: Mitsuaki Kojima, MD
Discussant: David Livingston, MD

7:50 am Paper #31 A STUDY OF METABOLIC DYNAMICS IN CRITICALLY INJURED PATIENTS
Presenter: Kai Wang, MD, DO
Discussant: David Harrington, MD

8:10 am Paper #32 PREPERITONEAL PELVIC PACKING REDUCES MORTALITY IN PATIENTS WITH LIFE-THREATENING HEMORRHAGE DUE TO UNSTABLE PELVIC FRACTURES
Presenter: Clay Cothren Burlew, MD
Discussant: David Spain, MD

8:30 am	Paper #33	PELVIC FRACTURE PATTERN PREDICTS THE NEED FOR HEMORRHAGE CONTROL INTERVENTION - RESULTS OF A MULTI-INSTITUTIONAL STUDY Presenter: Todd Costantini, MD Discussant: Joseph Galante, MD
8:50 am	Paper #34	FAILURE OF NONOPERATIVE MANAGEMENT OF PEDIATRIC BLUNT LIVER AND SPLEEN INJURIES: A MULTICENTER PROSPECTIVE STUDY Presenter: Maria Linnaus, MD Discussant: Barbara Gaines, MD
9:10 am	Paper #35	OVERALL SPLENECTOMY RATES REMAIN THE SAME DESPITE INCREASING USAGE OF ANGIOGRAPHY IN THE MANAGEMENT OF HIGH GRADE BLUNT SPLENIC INJURY Presenter: Scott Dolejs, MD Discussant: Andrew Peitzman, MD
9:30 am	Paper #36	THERE IS NOTHING LITTLE ABOUT THE IMPACT OF BABY ASPIRIN: THE RESULTS OF A PROSPECTIVE AAST MULTI-INSTITUTIONAL TRIAL OF ORAL ANTICOAGULANTS Presenter: Leslie Kobayashi, MD Discussant: Charles Wade, PhD
9:50 am	Paper #37	COLD STORAGE OF PLATELET CONCENTRATES SUPPLEMENTED WITH RESVERATROL/CYTOCHROME C PRESERVES PLATELET FUNCTION Presenter: Susan Evans, MD Discussant: Martin Schreiber, MD
10:10 am	Paper #38	DAILY PROPRANOLOL ADMINISTRATION PREVENTS PERSISTENT INJURY-ASSOCIATED ANEMIA FOLLOWING SEVERE TRAUMA AND CHRONIC STRESS Presenter: Ines Alamo, MD, MPH Discussant: Saman Arbabi, MD, MPH

10:30 am Paper #39	IS YOUR GRADUATING GENERAL SURGERY RESIDENT QUALIFIED TO TAKE TRAUMA CALL? A 15-YEAR APPRAISAL OF THE CHANGES IN GENERAL SURGERY EDUCATION FOR TRAUMA Presenter: Aaron Strumwasser, MD Discussant: Mark Malangoni, MD
10:45 – 11:00 am	**BREAK IN EXHIBIT AREA** Location: Grand Promenade/Kona Foyer
11:00 - 11:30 am	**SESSION VII: SCHOLARSHIP PRESENTATIONS** Location: Grand Ballroom Moderator: Grace Rozycki, MD, MBA
11:30 am - 12:30 pm	**SESSION VIII: FITTS LECTURE** Location: Grand Ballroom ***When Peace Breaks Out*** Presenter: M. Margaret Knudson, MD
12:30 - 1:30 pm	**INDUSTRY SATELLITE SYMPOSIUM** Location: Kohala 3
12:30 - 2:30 pm	**INDUSTRY SATELLITE SYMPOSIUM** Location: Kohala 2
1:00 - 4:00 pm	**OPTIONAL SESSION: AUSTRALIAN AND NEW ZEALAND (ANZAST/ATS) PODIUM PAPER SESSION** Location: Kohala 1 Moderator: Zsolt Balogh, MD, PhD
1:00 – 1:10 pm	AAST Keynote on Head Injury
1:10 – 1:20 pm	ANZ Keynote on Head Injury
1:20 – 1:30 pm	Discussion

1:30 – 2:30 pm	**Paper Session I**
1:30 pm	TALE OF TWO CITIES: PREHOSPITAL ENDOTRACHEAL INTUBATION WITH OR WITHOUT PARALYSING AGENTS IN PATIENTS WITH SEVERE TRAUMATIC BRAIN INJURY Presenter: Cino Bendinelli, MD Discussant: Rochelle Dicker, MD
1:50 pm	SEVERE CEREBRAL HYPOPERFUSION IS FREQUENTLY DETECTED BY EARLY PERFUSION-CT AND PREDICTS UNFAVOURABLE OUTCOME FOLLOWING SEVERE TRAUMATIC BRAIN INJURY. Presenter: Cino Bendinelli, MD Discussant: Juan Asensio, MD
2:10 pm	TRAUMA PATIENTS WITH PREHOSPITAL GLASGOW COMA SCORE LESS THAN NINE: NOT A HOMOGENOUS GROUP. Presenter: Cino Bendinelli, MD Discussant: Michel Aboutanos, MD, MPH
2:30 – 2:40 pm	AAST Keynote on Organ Failure
2:40 – 2:50 pm	ANZ Keynote on Organ Failure
2:50 – 3:00 pm	Discussion
3:00 – 4:00 pm	**Paper Session II**
3:00 pm	POSTINJURY MULTIPLE ORGAN FAILURE: MORE FREQUENT, MORE SEVERE BUT LESS DEADLY WITH LESS CRYSTALLOIDS. Presenter: Kate King, RN, MN Discussant: Andrew Kirkpatrick, CD, MD
3:20 pm	REDUCED DNASE ENZYME ACTIVITY IN RESPONSE TO HIGH POST-INJURY MITOCHONDRIAL DNA CONCENTRATION PROVIDES A THERAPEUTIC TARGET FOR SIRS Presenter: Daniel McIllroy, BS, MD, MRCS Discussant: Ronald Maier, MD

	3:40 pm	ELIXIR OF YOUTH, GDF11, IS INDUCED BY BLOOD LOSS IN TRAUMATIC INJURY Presenter: Gabrielle Briggs, PhD Discussant: Eric Ley, MD
4:00 pm		**CLOSE**

Friday, September 16, 2016

6:15 – 7:25 am	**COMMITTEE MEETINGS**
ACS Program Directors Committee	Kona 1
Education/CME Committee	Kona 2 & 3
Geriatric Trauma Committee	Kohala 2
Pediatric Trauma Committee	Kohala 3
Publications and Communication Committee	Kohala 4

6:30 – 7:30 am **INTERNATIONAL ATTENDEE BREAKFAST**
Location: Kohala 1
Patient assessment in polytrauma management – the basis to decide about safe definitive surgery vs damage control
Presenter: Hans-Christoph Pape, MD
ESTES Immediate Past President
(Ticketed Event)

7:00 am – 3:00 pm **REGISTRATION**
Location: Grand Promenade

7:00 am – 1:30 pm **EXHIBITS**
Location: Grand Promenade/Kona Foyer

7:00 – 8:30 am **BREAKFAST**
Location: Grand Promenade/Kona Foyer

7:30 - 10:30 am **SESSION IX: ACUTE CARE SURGERY PAPERS 40-48**
Location: Grand Ballroom
Moderator: Kimberly Davis, MD, MBA
Recorder: Joseph Minei, MD, MBA

7:30 am Paper #40 EXPANDING THE SCOPE OF QUALITY MEASUREMENT IN SURGERY TO INCLUDE NON-OPERATIVE CARE: RESULTS FROM THE ACS NSQIP EMERGENCY GENERAL SURGERY PILOT
Presenter: Michael Wandling, MD
Discussant: John Fildes, MD

7:50 am	Paper #41	SARCOPENIA INCREASES LONG-TERM MORTALITY IN ELDERLY PATIENTS UNDERGOING EMERGENCY GENERAL SURGERY Presenter: Erika Rangel, MD, MS Discussant: Kevin Schuster, MD, MPH
8:10 am	Paper #42	HIGH SENSITIVITY AND SPECIFICITY FOR ULTRASOUND IN THE DIAGNOSIS OF APPENDICITIS Presenter: Swathi Reddy, MD Discussant: Marie Crandall, MD, MPH
8:30 am	Paper #43	PNEUMATOSIS INTESTINALIS PREDICTIVE EVALUATION STUDY (PIPES): A MULTICENTER EPIDEMIOLOGIC STUDY OF THE AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA. Presenter: Rachael Callcut, MD Discussant: Fred Luchette, MD, MSc
8:50 am	Paper #44	INCREASED ANATOMIC INJURY PREDICTS OUTCOMES: VALIDATION OF AAST EMERGENCY GENERAL SURGERY GRADE IN APPENDICITIS Presenter: Matthew Hernandez, MD Discussant: Nicole Stassen, MD
9:10 am	Paper #45	HOSPITALS WITH HIGHER VOLUMES OF EMERGENCY GENERAL SURGERY PATIENTS ACHIEVE LOWER MORTALITY RATES: A CASE FOR ESTABLISHING DESIGNATED CENTERS FOR EMERGENCY GENERAL SURGERY Presenter: Shahid Shafi, MD Discussant: David Hoyt, MD
9:30 am	Paper #46	CIRCULATING SYNDECAN-1 DETECT THE DEVELOPMENT OF DISSEMINATED INTRAVASCULAR COAGULATION IN PATIENTS WITH SEPSIS Presenter: Mitsunori Ikeda, MD Discussant: Sonlee West, MD

9:50 am Paper #47	INTERNATIONAL ROTATIONS: A VALUABLE RESOURCE TO SUPPLEMENT OPERATIVE EXPERIENCE FOR ACUTE CARE SURGERY, TRAUMA AND SURGICAL CRITICAL CARE FELLOWS. Presenter: Paula Ferrada, MD Discussant: Martin Croce, MD
10:10 am Paper #48	IMPAIRED ADIPONECTIN TRANSPORT CAPACITY IN LEUKOCYTES FROM CRITICALLY ILL PATIENTS Presenter: Yutaka Umemura, MD Discussant: Jon Simmons, MD
10:30 - 11:45 am	**SESSION X: PANEL – IOM REPORT ON MILITARY CIVILIAN COLLABORATION** Location: Grand Ballroom Moderator: Todd Rasmussen, MD and David Hoyt, MD Panelists: Thomas Scalea, MD, John Holcomb, MD, M. Margaret Knudson, MD, Donald Jenkins, MD, Matthew Martin, MD, and Ronald Stewart, MD

11:45 am - 1:00 pm	Lunch Sessions
Lunch Session VII	The Conundrum of Federal Trauma Research Funding: Current Risks and Near, Mid-and Long-term consideration for Trauma and Injury Funding in the US Moderators: Todd Rasmussen, MD and Jennifer Hatzfeld, RN, PhD Presenters: Ronald Stewart, MD, Jeremy Brown, MD, Jennifer Hatzfeld, RN, PhD, and Todd Rasmussen, MD
Lunch Session VIII	Overcoming the EHR: Combining Trauma Care and the Computer Moderator: Jason Smith, MD Presenters: Jason Smith, MD, and Thomas Santora, MD
Lunch Session IX	Rib Fixation: Who, When, Why Moderator: Marc de Moya, MD Presenters: Walter Biffl, MD, Raminder Nirula, MD, PhD and Andrew Doben, MD
Lunch Session X	Complex Abdominal Vascular Trauma Presenters: Raul Coimbra, MD, PhD, and David Feliciano, MD
Lunch Session XI	Rare or Unusual Hernias Moderator: Jose Diaz, MD Presenters: Martin Croce, MD, and Charles Adams, MD
Lunch Session XII	Stop the Bleeding: Establishing a Comprehensive, Community-Wide Hemorrhage Control Program Across Your Trauma System Moderator: Alexander Eastman, MD Presenters: Lenworth Jacobs, MD, MPH, and Ronald Stewart, MD

1:00 – 4:40 pm		SESSION XIA: PAPERS 49-59
		Location: Grand Ballroom Moderator: Rosemary Kozar, MD, PhD Recorder: Ali Salim, MD
1:00 pm	Paper #49	FACING THE FACTS ON PROPHYLACTIC ANTIBIOTICS AND FACIAL FRACTURES: ONE DAY OR LESS Presenter: Brenda Zosa, MD Discussant: Heather Evans, MD
1:20 pm	Paper #50	A PREDICTOR OF MORTALITY RIGHT UNDER THE NOSE: MEASURING SARCOPENIA IN ELDERLY TRAUMA PATIENTS USING HEAD CT Presenter: James Wallace, MD Discussant: Zara Cooper, MD, MSc
1:40 pm	Paper #51	IMPACT OF A NOVEL PI3-KINASE INHIBITOR IN PREVENTING MITOCHONDRIAL DNA DAMAGE AND DAMAGE ASSOCIATED MOLECULAR PATTERN ACCUMULATION: RESULTS FROM THE BIOCHRONICITY PROJECT Presenter: George Black, MD Discussant: Zsolt Balogh, MD, PhD
2:00 pm	Paper #52	PREHOSPITAL PLASMA RESUSCITATION ASSOCIATED WITH IMPROVED NEUROLOGIC OUTCOMES IN TRAUMATIC BRAIN INJURY Presenter: Cornelius Thiels, DO Discussant: Jeremy Cannon, MD
2:20 pm	Paper #53	SYNDECAN-1: A QUANTITATIVE MARKER FOR THE ENDOTHELIOPATHY OF TRAUMA Presenter: Erika Gonzalez Rodriguez, MD Discussant: Rosemary Kozar, MD, PhD
2:40 pm	Paper #54	DAMAGE CONTROL LAPAROTOMY UTILIZATION RATES ARE HIGHLY VARIABLE AMONG LEVEL 1 TRAUMA CENTERS: PROPPR FINDINGS Presenter: Justin Watson, MD Discussant: Ben Zarzaur, Jr., MD, MPH

3:00 pm	Paper #55	CLINICAL CORRELATES TO ASSIST WITH CTE DIAGNOSIS: INSIGHTS FROM A NOVEL RODENT REPEAT TBI MODEL Presenter: Gretchen Thomsen, PhD Discussant: Michael Dubick, MD
3:20 pm	Paper #56	D-DIMER MAY SIGNIFICANTLY REDUCE UNNECESSARY CT SCANS IN PEDIATRIC HEAD TRAUMA: A POTENTIAL FOR PECARN+ Presenter: Simone Langness, MD Discussant: Brian Leininger, MD
3:40 pm	Paper #57	ABNORMALITIES IN FIBRINOLYSIS ARE ASSOCIATED WITH VENOUS THROMBOEMBOLISM, MORTALITY, AND DISABILITY IN A PEDIATRIC TRAUMA POPULATION Presenter: Christine Leeper, MD Discussant: R. Todd Maxson, MD
4:00 pm	Paper #58	1:1 TRANSFUSION STRATEGIES ARE RIGHT FOR THE WRONG REASON Presenter: Stephanie Savage, MD, MS Discussant: Yasuhiro Otomo, MD
4:20 pm	Paper #59	POPULATION-BASED ESTIMATES OF VIOLENCE-RELATED DEATH RATES FOR LAW ENFORCEMENT PERSONNEL: THE RISK OF DEATH ARE HIGHER AND INCREASING OVER TIME Presenter: Alexander Eastman, MD, MPH Discussant: William Cioffi, MD
1:00 – 4:40 pm		**SESSION XIB: PAPERS 60-70** Location: Kona 4 & 5 Moderator: Jonathan Tilsed, MD, ESTES President Recorder: Sharon Henry, MD
1:00 pm	Paper #60	IMPACT OF EARLY OPERATIVE PELVIC FIXATION ON LONG-TERM FUNCTIONAL OUTCOME FOLLOWING SEVERE PELVIC FRACTURE Presenter: John Sharpe, MD, MS Discussant: Walter Biffl, MD

1:20 pm	Paper #61	CERVICAL SPINE MRI IN PATIENTS WITH NEGATIVE CT: A PROSPECTIVE, MULTICENTER STUDY OF THE RESEARCH CONSORTIUM OF NEW ENGLAND CENTERS FOR TRAUMA (ReCONECT) Presenter: Adrian Maung, MD Discussant: Kenji Inaba, MD
1:40 pm	Paper #62	SYSTEMIC INTRAOPERATIVE ANTICOAGULATION DURING MAJOR ARTERIAL INJURY REPAIR: IMPLICATIONS FOR PATENCY AND BLEEDING Presenter: Zoe Maher, MD Discussant: Ian Civil, MBE
2:00 pm	Paper #63	PREDICTING MORTALITY IN OLDER TRAUMA PATIENTS: A NOVEL METRIC BASED ON PRE-EXISTING CONDITIONS Presenter: Richard Calvo, PhD, MPH Discussant: Kristan Staudenmayer, MD, MSc
2:20 pm	Paper #64	IDENTIFYING AUGMENTED RENAL CLEARANCE IN TRAUMA PATIENTS: VALIDATION OF THE AUGMENTED RENAL CLEARANCE IN TRAUMA INTENSIVE CARE (ARCTIC) SCORING SYSTEM Presenter: Jeffrey Barletta, BS, PharmD, FCCM Discussant: Lewis Kaplan, MD
2:40 pm	Paper #65	THE FRAIL SCALE: A USEFUL TOOL FOR BEDSIDE SCREENING OF GERIATRIC TRAUMA PATIENTS Presenter: Cathy Maxwell, PhD Discussant: Orlando Kirton, MD, MBA
3:00 pm	Paper #66	APPLICATION OF EXOGENOUS PMN TO THE AIRWAY RESCUES BACTERIAL OVERGROWTH INITIATED BY TRAUMA DAMPS Presenter: Kiyoshi Itagaki, PhD Discussant: Ronald Maier, MD

3:20 pm	Paper #67	PARENTERAL AND ENTERAL NUTRITION HAVE DIVERGENT EFFECTS ON RIBONUCLEOTIDE SYNTHESIS, NITROGEN AND KREBS CYCLE METABOLISM AFTER TRAUMATIC INJURY Presenter: Grant O'Keefe, MD, MPH Discussant: Christopher Dente, MD
3:40 pm	Paper #68	EVALUATION OF GUIDELINES FOR INJURED CHILDREN AT HIGH RISK FOR VTE: A PROSPECTIVE OBSERVATIONAL STUDY Presenter: Rachel Landisch, MD Discussant: Denis Bensard, MD
4:00 pm	Paper #69	TROJAN HORSE OUT OF BARN: TRAUMA PATIENTS' CELL FREE SERA CONTAINS FUNCTIONAL MITOCHONDRIA INDICATING POOR OUTCOME Presenter: Eszter Tuboly, PhD Discussant: James Hoth, MD
4:20 pm	Paper #70	IMPACT OF INCLUDING HIGHEST GCS MOTOR SCORE IN THE RISK-ADJUSMENT OF TRAUMATIC BRAIN INJURY MORTALITY Presenter: David Gomez, MD, PhD Discussant: Adil Haider, MD, MPH
4:50 – 5:00 pm		**MILITARY MEDALS** Location: Grand Ballroom Presiding: Raymond Fang, MD
5:00 - 6:15 pm		**AAST ANNUAL BUSINESS MEETING** Location: Kona 4 & 5 Presiding: Grace Rozycki, MD, MBA
6:30 – 9:00 pm		**ANNUAL BANQUET/LUAU** Location: Palace Lawn

Saturday, September 17, 2016

7:00 – 8:00 am	**NEW MEMBER BREAKFAST** Location: Kona 2 & 3
7:00 – 8:30 am	**BREAKFAST** Location: Lagoon Lani
8:00 - 9:18 am	**SESSION XII: QUICKSHOT SESSION I** Location: Kona 4 & 5 Moderator: David Livingston, MD
8:00 am QS1	TRAUMA DECREASES MONOCYTE INFLAMMATORY ACTIVITY DESPITE PERIPHERAL EXPANSION Presenter: Anupamaa Seshadri, MD Discussant: Peter Rhee, MD, MPH
8:06 am QS2	THE ALVARADO SCORE SHOULD BE USED TO REDUCE EMERGENCY DEPARTMENT LENGTH OF STAY AND RADIATION EXPOSURE IN SELECT PATIENTS WITH ABDOMINAL PAIN Presenter: Jamie Coleman, MD Discussant: Elizabeth Benjamin, MD
8:12 am QS3	"NO ZONE" APPROACH IN PENETRATING NECK TRAUMA REDUCES UNNECESSARY COMPUTED TOMOGRAPHY ANGIOGRAPHY AND NEGATIVE EXPLORATIONS Presenter: Kareem Ibraheem, MD Discussant: John Bini, MD
8:18 am QS4	THE CARDIOVASCULAR EFFECTS OF RAPID SEQUENCE INTUBATION: RECONSIDERING THE A, B, C'S OF TRAUMA RESUSCITATION Presenter: Seda Bourikian, MD Discussant: Herbert Phelan, MD
8:24 am QS5	PROSPECTIVE EVALUATION OF ADMISSION CORTISOL IN TRAUMA Presenter: Amy Kwok, MD, MPH Discussant: Luke Leenen, MD, PhD

8:30 am QS6	NONOPERATIVELY MANAGED BLUNT SPLENIC TRAUMA IS ASSOCIATED WITH HIGHER INCIDENCE OF VENOUS THROMBOEMBOLISM Presenter: Charles Karcutskie, MD Discussant: Jordan Weinberg, MD
8:36 am QS7	ANGIOEMBOLIZATION IN THE MANAGEMENT OF ISOLATED SPLENIC INJURIES: IS THERE REALLY A RELATIONSHIP BETWEEN EMBOLIZATION AND SPLENIC SALVAGE? Presenter: Graeme Rosenberg, MD Discussant: Indermeet Bhullar, MD
8:42 am QS8	THE MANGLED EXTREMITY SCORE AND AMPUTATION: TIME FOR A REVISION Presenter: Melissa Loja, MD Discussant: Jon Perlstein, MD
8:48 am QS9	BEYOND THE PROPPR RATIO: TRANSFUSING YOUNG BLOOD IMPROVES CLINICAL OUTCOMES IN SEVERELY INJURED TRAUMA PATIENTS Presenter: John Yonge, MD Discussant: Louis Magnotti, MD
8:54 am QS10	ACUTE VASCULAR INTERVENTIONAL RADIOLOGY TECHNIQUES IN ACUTE CARE MEDICINE AND SURGERY PERFORMED BY TRAINED ACUTE CARE PHYSICIANS. Presenter: Junya Tsurukiri, MD, PhD Discussant: A. Peter Ekeh, MD
9:00 am QS11	EARLY FLUID OVERRESUSCITATION PATTERNS IN SEVERE PEDIATRIC BURN INJURIES AND INFLUENCE ON OUTCOMES Presenter: Lindsay Talbot, MD Discussant: Tina Palmieri, MD
9:06 am QS12	IMPROVED PREDICTION OF HIT IN THE SICU USING A SIMPLIFED MODEL OF THE WARKENTIN 4-T SYSTEM: 3-T Presenter: Matthew Bloom, MD Discussant: Steven Johnson, MD

9:12 am QS13	HIGH RATIO PLASMA RESUSCITATION DOES NOT IMPROVE SURVIVAL IN PEDIATRIC TRAUMA PATIENTS Presenter: Jeremy Cannon, MD Discussant: David Notrica, MD
9:20 – 9:35 am	**BREAK** Location: Grand Promenade/Kona Foyer
9:36 - 11:00 am	**SESSION XIII: QUICKSHOT SESSION II** Location: Kona 4 & 5 Moderator: Michael Sise, MD
9:36 am QS14	ADMISSION N-TERMINAL PRO-BRAIN NATRIURETIC PEPTIDE CONCENTRATIONS PREDICT DEVELOPMENT OF ATRIAL FIBRILLATION IN GENERAL SURGICAL INTENSIVE CARE UNIT PATIENTS Presenter: David Yeh, MD Discussant: Kevin Schuser, MD, MPH
9:42 am QS15	EARLY TRANEXAMIC ACID ADMINISTRATION AMELIORATES THE ENDOTHELIOPATHY OF TRAUMA AND SHOCK Presenter: Lawrence Diebel, MD Discussant: Grant O'Keefe, MD, MPH
9:48 am QS16	ASPIRIN CHEMOPROPHYLAXIS DECREASES VENOUS THROMBOEMBOLISM IN 13,221 TRAUMA PATIENTS Presenter: Michelle Scerbo, MD Discussant: Raminder Nirula, MD, PhD
9:54 am QS17	DEVELOPMENT OF A NOVEL COOLING TOURNIQUET TO MINIMIZE ISCHEMIC INJURY IN EXTREMITY TRAUMA Presenter: Shahram Aarabi, MD, MPH Discussant: Warren Dorlac, MD

10:00 am QS18	DAMAGE CONTROL SURGERY IN WEIGHTLESSNESS: A COMPARATIVE STUDY OF TORSO HEMORRHAGE CONTROL COMPARING TERRESTRIAL AND WEIGHTLESS CONDITIONS Presenter: Andrew Kirkpatrick, MD Discussant: Christine Gaarder, MD
10:06 am QS19	THE IMPACT OF ACUTE CARE SURGERY SERVICE ON TIMELINESS OF CARE FOR PATIENTS WHO REQUIRE EMERGENT EXPLORATORY LAPAROTOMY FOR ACUTE ABDOMEN. Presenter: Kaori Ito, MD Discussant: Jason Lees, MD
10:12 am QS20	NONOPERATIVE MANAGEMENT RATHER THAN ENDOVACSCUALR REPAIR MAY BE SAFE FOR GRADE II TRAUMATIC AORTIC INJURIES: A TEN YEAR RETROSPECIVE ANALYSIS Presenter: Steven Spencer, MD Discussant: J. Wayne Meredith, MD
10:18 am QS21	IMPROVED PREDICTION OF MOF BY NON-INVASIVE ASSESSMENT OF MICROCIRCULATORY CHANGES AFTER SEVERE SHOCK AND RESUSCITATION IN TRAUMA Presenter: Alberto Garcia, MD Discussant: Gregory Victorino, MD
10:24 am QS22	FROM SKIN TO WITHIN – A COMPARISON OF THREE TISSUE PERFUSION MEASUREMENT TECHNIQUES AND IDENTIFICATION OF SURVIVAL THRESHOLDS Presenter: David Inouye, MD, PhD Discussant: Gail Tominaga, MD
10:30 am QS23	COMPENSATORY RESERVE INDEX: PERFORMANCE OF A NOVEL MONITORING TECHNOLOGY TO IDENTIFY THE BLEEDING TRAUMA PATIENT Presenter: Michael Johnson, MD Discussant: Raymond Fang, MD

10:36 am QS24	UNDERTRIAGE OF SEVERELY INJURED ADULTS IN THE UNITED STATES: WHO IS NOT GETTING TO THE RIGHT PLACE AT THE RIGHT TIME? Presenter: Jennifer Leonard, MD, PhD Discussant: Jeffrey Salomone, MD
10:42 am QS25	THE LUNG RESCUE UNIT (LRU) - DOES A DEDICATED INTENSIVE CARE UNIT FOR VENO-VENOUS EXTRA-CORPOREAL MEMBRANE OXYGENATION (VV ECMO) IMPROVE SURVIVAL TO DISCHARGE? Presenter: Jay Menaker, MD Discussant: Lena Napolitano, MD, MPH
10:48 am QS26	PROGNOSTIC VALUE OF PRE-OPERATIVE IMAGING AND OPERATIVE FINDINGS IN YOUNG MEN WITH ACUTE APPENDICITIS Presenter: Madhu Subramanian, MD, BS Discussant: Carlos Brown, MD
11:00 am	**MEETING ADJOURNED**

AAST INFORMATION

(TAB #2)

AAST INFORMATION

(TAB #2)

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Vice-President.....Michael J. Sise, M.D.
San Diego, California

Secretary-Treasurer.....Martin A. Croce, M.D.
Memphis, Tennessee

Secretary-Treasurer - Elect.....Eileen M. Bulger, M.D.
Seattle, Washington

Recorder and Program Chairman.....David A. Spain, M.D.
Stanford, California

Past President 2012-2013..... Robert C. Mackersie, M.D.
San Francisco, California

Past President 2013-2014..... William G. Cioffi, M.D.
Providence, Rhode Island

Past President 2014-2015.....Thomas M. Scalea, M.D.
Baltimore, Maryland

Manager-at-Large (2016).....Rosemary A. Kozar, M.D., Ph.D.
Baltimore, Maryland

Manager-at-Large (2017).....Edward E. Cornwell, III, M.D.
Washington, District of Columbia

Manager-at-Large (2018).....David H. Livingston, M.D.
Newark, New Jersey

Critical Care Manager-at-Large (2016).....Orlando C. Kirton, M.D., M.B.A.
Abington, Pennsylvania

Acute Care Surgery Manager-at-Large (2017).....Kimberly A. David, M.D., M.B.A.
Hartford, Connecticut

REPRESENTATIVES
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THE AMERICAN ASSOCIATION
FOR THE
SURGERY OF TRAUMA

2015-2016

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Martin A. Croce, M.D. (2012-2018)
Memphis, Tennessee

REPRESENTATIVE TO THE
BOARD OF GOVERNORS
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Therese M. Duane, M.D. (2012-2018)
Richmond, Virginia

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. (2016-2021)
Dallas, Texas

Eileen M. Bulger, M.D. (2012-2018)
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REPRESENATIVE TO THE AMERICAN ASSOCIATION OF BLOOD BANKS
Colonel John B. Holcomb, M.D. (2007-2016)
Houston, Texas

REPRESENATIVE TO THE GENERAL SURGERY ADVISORY BOARD OD THE
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Michael Chang, M.D. (2013-2016)
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REPRESENATIVE TO THE WORLD HEALTH ORGANIZATION
Raul Coimbra, M.D., Ph.D. (2012-2017)
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Basil A. Pruitt, Jr., M.D. (1996-)
San Antonio, Texas

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Clay Cothren Burlew, MD, Vice Chair (2018)
Charles Adams, Jr., MD (2016)
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Marc DeMoya, MD (2017)
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Robert Mackersie, MD, *Ex-Officio (2016)*
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Christopher Dente, MD, *Consultant on new case log reports*

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Trauma Association of Canada
Pan American Trauma Society
International Association for Trauma Surgery and Intensive Care

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Eileen Bulger, MD (2017)
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Adam Fox, MD (2017)
EAST Representatives
Kyle Remick, MD
Daniel Grabo, MD

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Samir Fakhry, MD (2018)
Shahid Shafi, MD (2018)
Thomas Esposito, MD (2018)

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Oscar Guillamondegui, MD, MPH (2018)
Suresh Agarwal, Jr., MD (2018)

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Jermica M. Smith, Program Manager
Karla Stuecker, Sr. Meeting Planner, ACS
Bridget Lindbloom, Education Manager
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Timothy C. Fabian, MD, Editor
Kelly Horwood, Editorial Assistant

FUTURE AAST MEETINGS

76th Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery

September 13-16, 2017
Baltimore Marriott Waterfront
Baltimore, MD

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

September 26-29, 2018
Manchester Grand Hyatt
San Diego, CA

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

PAST PRESIDENTS AND MEETING SITES

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.

ABSTRACTS OF PAPERS

(TAB #3)

ABSTRACTS OF PAPERS

(TAB #3)

SEVENTY-FIFTH MEETING OF THE AMERICAN ASSOCATION FOR THE SURGERY OF TRAUMA AND CLINICAL CONGRESS OF ACUTE CARE SURGERY

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.

WELCOME
Wednesday, September 14, 2016, 7:30 AM -7:50 AM
GRAND BALLROOM
PRESIDING: Grace S. Rozycki, M.D., M.B.A.

SESSION I: Plenary – Papers #1- #9
Wednesday, September 14, 2016, 7:50 AM –10:50 AM
GRAND BALLROOM
MODERATOR: Raul Coimbra, M.D., Ph.D.
RECORDER: David A. Spain, M.D.

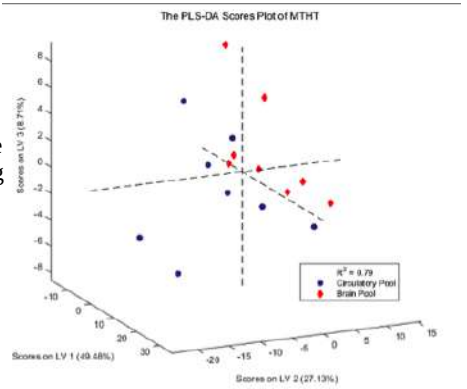
Session: I: Plenary Papers 1-9
Paper 1: 7:50 - 8:10 AM

OPTIMIZATION BRAIN METABOLISM USING METABOLIC-TARGETED HYPOTHERMIA THERAPY CAN REDUCE MORTALITY OF TRAUMATIC BRAIN INJURY

Wen-yuan Wang MBBS, Jin-zhou Feng MBBS, Jun Zeng MBBS, Zhi-yuan Zhou BS, Jin Peng Ph.D., Hao Yang Ph.D., Shi-jun Li MBBS, Charles D. Lu Ph.D.,
Sichuan Academy Of Medical Sciences

Invited Discussant: Daniel Eiferman, MD

Introduction: Hypothermia therapy has been widely used to treat traumatic brain injuries (TBI). But a major challenge remains: how to target hypothermia therapy. We hypothesized that lowering metabolic rate should be the target of hypothermia therapy rather reaching a fixed body temperature. We assumed that optimizing metabolic conditions, especially the brain metabolic environment, could offer better benefit to neurologic protection. We designed a RCT to test this hypothesis and conducted a metabolomics study to explore the mechanic.
Methods: This is a single-blind randomized controlled trial. Severe TBI patients with Glasgow Coma Scale (GCS) ranged 3-8 were randomly divided into 1) the study group: 50-60% rest metabolic ratio as the target of hypothermia therapy (metabolic targeted hypothermia treatment: MTHT); 2) the control group: 32-35°C body temperature was set as the target of hypothermia therapy (body temperature targeted hypothermia treatment: BTHT). The intervention time was 7 days for both groups. The brain metabolic pool (through jugular vein) and circulatory metabolic pool (through subclavian vein) serum samples were collected at the baseline, and on days 1, 3 and 7 during the hypothermia treatment. In total, 112 serum samples were collected from 8 participants from the MTHT group and 6 from the BTHT group. The primary outcome was mortality. Using the 1H-NMR technology, we tracked and located the disturbances of metabolic networks.
Results: Eighty-three severe TBI patients were recruited from December 2013 to December 2014, of which 42 were assigned to the MTHT group and 41 were assigned to the BTHT group. The mean age was 39.65±10.06 years, 68.67% participants were male, and GCS 6.25±0.97. The mortality of the MTHT group was significantly lower than that of the BTHT group (5 vs. 12, p=0.050). When serum samples were analyzed, there was significant difference between the brain and circulatory metabolic patterns in the MTHT patients compared with the BTHT patients (see figure). And we found a group of metabolites through 1H-NMR metabolomics, which can be used as neuro-protective monitoring parameters for hypothermia treatment.
Conclusion: The MTHT appears to be an ideal strategy that can significantly reduce the mortality of severe TBI patients. Metabolomics research showed that this strategy could effectively improve brain metabolism, suggesting that reducing metabolic rate by 40%~50% should be set as the target of hypothermia therapy. In addition, 1H-NMR based metabolomics is a time sensitive and easy-to-use high-throughput tool that can be applied in clinical evaluation for TBI treatment.



NOTES

Session: I: Plenary Papers 1-9
Paper 2: 8:10 - 8:30 AM

STAPLED VS HANDSEWN : A PROSPECTIVE EMERGENCY SURGERY STUDY (SHAPES)

Brandon R. Bruns MD, David S. Morris MD, Toby M. Ennis MD, Alisan Fathalizadeh MD,MPH, Joseph Sakran MD,MPH, Kristen Arnold MD, Nathan M. Mowery* MD, David Turay, MD, Jason Murry MD, Oliver L. Gunter* MD,MPH, Joseph D. Love DO, Matthew Carrick MD, David Skarupa MD, Anthony Herrera Jose J. Diaz* MD,
University of Maryland Medical Center

Invited Discussant: Gregory Jurkovich, MD

Introduction: Data from the trauma patient population suggest handsewn anastomoses (HS) are superior to stapled (ST). A recent retrospective study in emergency general surgery (EGS) patients had similar findings. The aim of the current study is to prospectively evaluate anastomotic failure rates for HS and ST anastomoses in EGS patients undergoing urgent/emergent operations.
Methods: The study was sponsored by the AAST Multi-Institutional Studies Committee. Patients undergoing urgent/emergent bowel resection for EGS pathology were prospectively enrolled from 7/22/2013-12/31/2015. Patients were grouped by HS vs ST anastomoses and demographic and clinical variables were collected. The primary outcome was anastomotic failure. Similar to other studies, anastomotic failure (leak, abscess, fistula) was evaluated at the anastomosis level. Multivariable logisitic regression was performed controlling for age and risk factors for anastomotic failure.
Results: Fifteen institutions enrolled a total of 595 patients with 649 anastomoses (253 HS and 396 ST). Mean age was 61-years and 51% were male with 7% overall mortality. Age and sex were the same between groups. The overall anstomotic failure rate was 12.5%. The HS group had higher lactate (2.1 vs 1.6, $p<0.01$) and lower albumin (3.2 vs 3.5, $p<0.01$). Hospital and ICU days, as well as mortality, were all greater in the HS group. Anastomotic failure rates and operative time was similar for HS & ST techniques (TABLE). On multivariate regression, the presence of contamination at initial bowel resection (OR 1.965; 95% CI 1.183-3.264) and the patient being managed with an open abdomen (OR 2.529; 95% CI 1.492-4.286) were independently associated with anastomotic failure, while the type of anastomosis (HS vs ST) was not.
Conclusion: EGS patients requiring bowel resection and anastomosis are at high risk for anastomotic failure. The current study illustrates an apparent bias among acute care surgeons to perform HS anastomoses in higher risk patients. Despite the individualized application of anastomotic technique for differing patient populations, the risk of anastomotic failure was equivalent when comparing HS and ST techniques.

	HS	ST	p-value
Anastomotic Failures, n (%)	39 (15.4)	42 (10.6)	0.07
Failures by Type, n (%)			
Small bowel to small bowel	31/204 (15)	25/262 (10)	0.06
Small bowel to large bowel	4/35 (11)	11/104 (11)	0.89
Large bowel to large bowel	4/14 (29)	6/30 (20)	0.53
Operative Time, min*	165 [120-218]	152 [104-222]	0.13
Hospital LOS*	14 [9-24]	10 [7-18]	<0.01
ICU LOS*	5 [0-13]	0 [0-5]	<0.01
Mortality, n (%)	36 (14.2)	20 (5.1)	<0.01

NOTES

Session: I: Plenary Papers 1-9
Paper 3: 8:30 - 8:50 AM

WeBET THAT WEIGHT BASED ENOXAPARIN DOSING DECREASES DVT IN HOSPITALIZED TRAUMA PATIENTS: A RANDOMIZED, CONTROL, DOUBLE BLIND TRIAL

Annika B. Kay PA-C, Sarah Majercik* MBA, MD, Thomas W. White MD, Jeffrey Sorensen MStat, Scott M. Stevens MD, Scott C. Woller MD, Joseph Bledsoe MD, Intermountain Medical Center

Invited Discussant: Gerald Fortuna, Jr., MD

Introduction: Venous thromboembolism (VTE) is a major cause of morbidity and mortality in trauma patients. Currently, chemoprophylaxis with low molecular weight heparin (LMWH) at a standardized dose is recommended, regardless of body mass index (BMI). There is some evidence that conventional chemoprophylaxis may be inadequate in high-risk patients. We hypothesized that a weight-adjusted enoxaparin prophylaxis regimen would reduce the frequency of VTE in hospitalized trauma patients and at 90 day follow up.

Methods: This is a prospective, randomized, double-blind control trial of adult patients weighing ≥ 60kg admitted to the trauma service at a single Level One Trauma Center between July 2013 and January 2015. Exclusion criteria included any contraindication to immediate chemoprophylaxis, history of coagulation abnormality, or pre-injury use of anticoagulants/antiplatelet agents. Subjects were randomized to receive either standard (ST) (30 mg SQ every 12 hours) or weight-based (WB) (0.5mg/kg SQ every 12 hours) enoxaparin dosing. Surveillance duplex ultrasound (DUS) for asymptomatic lower extremity deep vein thrombosis (DVT) was performed on hospital days 1, 3, 7, and weekly thereafter. Symptomatic VTE was pursued at the discretion of the attending surgeon. The primary outcome was DVT during the index hospitalization. Secondary outcomes included VTE at 90 days, significant bleeding events, thrombocytopenia or other suspected adverse drug reactions.

Results: 238 (127 ST, 111 WB) subjects were enrolled in the study. There was no difference between ST and WB groups with regard to age, admission BMI, gender, ISS, or percentage that had a surgical procedure. The WB group tended to be more likely to have a lower extremity AIS ≥ 2 ($p=0.07$). Mean enoxaparin dose in the WB group was higher than the STD group, as expected (43mg vs. 31mg, $p<0.001$). Lower extremity DVT tended to occur more frequently during hospitalization in the ST group (12 (9.4%) STD vs. 4 (3.6%) WB, $p=0.11$). At 90 day follow up, there was no difference in VTE rate (12 (9.4%) ST vs. 7 (6.3%) WB, $p=0.51$). ST group developed DVT sooner than the WB group (2.5±2 days ST vs. 10.1±7.6 days WB, $p<0.001$). Subgroup analysis of subjects with ISS>15 (27 ST, 24 WB) found no difference in in-hospital DVT between ST and WB (11.1% ST vs. 4.2% WB, $p=0.6$). There was one major bleeding event, which occurred in a ST subject. There was one pulmonary embolism, which occurred in a ST subject.

Conclusion: WB enoxaparin dosing for VTE chemoprophylaxis in trauma patients appears to be safe and may result in a lower rate of VTE during the index hospital stay. WB dosing does lead to more DVT-free hospital days. This protective effect does not appear to extend out to 90 days after hospital discharge, however. Larger scale studies are necessary to determine whether WB dosing is superior to ST.

NOTES

Session: I: Plenary Papers 1-9
Paper 4: 8:50 - 9:10 AM

ACUTE RIGHT HEART FAILURE AFTER TRAUMA PNEUMONECTOMY – IS IT PREVENTABLE?: A BLINDED RANDOMIZED CONTROLLED ANIMAL TRIAL USING INHALED NITRIC OXIDE (iNO)

Andrea L. Lubitz MD, Lars O. Sjoholm MD, Amy Goldberg* MD, Zoe Maher MD, Abhijit Pathak* MD, Thomas Santora* MD, Thomas E. Sharp III, Ph.D. Candidate, Markus Wallner MD, Remus M. Berretta BS, Lauren A. Poole BS, Jichuan Wu MD,Ph.D., Marla R. Wolfson Ph.D., Katz School Of Medicine At Temple University

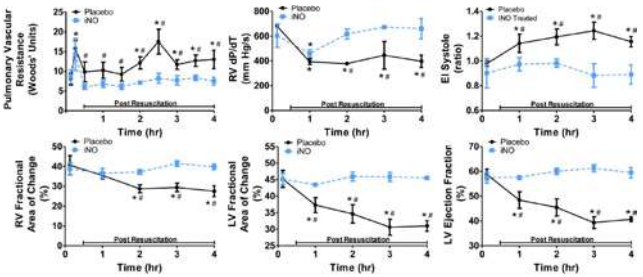
Invited Discussant: James O'Connor, MD

Introduction: Trauma pneumonectomy is associated with mortality rates ranging from 50-100%, mainly thought to be related to right heart failure. An acute increase in pulmonary vascular resistance (PVR) occurs from the combination of pneumonectomy and hemorrhagic shock. Ultimately, the increase in PVR and associated increase in right ventricular (RV) afterload leads to acute RV failure, thus reducing left ventricular (LV) preload and output. Inhaled nitric oxide (iNO) lowers PVR by relaxing pulmonary arterial smooth muscle without remarkable systemic vascular effects. We hypothesized that with hemorrhagic shock and pneumonectomy, iNO can be used to decrease PVR and mitigate right heart failure. **Methods**: A simulated hemorrhagic shock and pneumonectomy model was developed using anesthetized sheep (n=12). Sheep received lung protective ventilatory support and were instrumented to serially obtain measurements of hemodynamics, gas exchange and blood chemistry. Heart function was assessed with echocardiography. A median sternotomy was performed and then sheep were randomized to study gas of iNO 20 ppm (n = 6) or nitrogen as placebo (n = 6). Baseline (BL) measurements were obtained, after which hemorrhagic shock was initiated by exsanguination to a target of 50% of the baseline mean arterial pressure (MAP). Within 15 mins of reaching the target MAP, the resuscitation phase (RP) was initiated, consisting of simultaneous left pulmonary hilum ligation, re-infusion of blood and initiation of study gas. Animals were then monitored for 4 hrs. Data were analyzed by multifactor ANOVA for time and treatment group. **Results**: At the initiation of the RP, all animals had an initial increase in PVR. PVR continued to increase with placebo, whereas with iNO, PVR decreased back to BL over time. While both groups experienced an initial increase in RV pressure overload from BL [ie. Eccentricity Index (EI) in systole], this increase was less in animals treated with iNO. Over time, the EI continued to increase with placebo, whereas with iNO it returned to BL values within 2 – 3 hrs. While both groups demonstrated a decrease in RV contractility [RV dP/dT], with iNO the RV dP/dT returned to BL values by 2 hrs, but remained decreased with placebo. RV and LV wall motion [Fractional Area of Change (FAC)], and LV ejection fraction continued to decrease following RP with placebo but remained within BL value with iNO. Lactate [mmol/L] increased and SvO2 [%] decreased from BL initially with RP in both groups. Over time and by 4hrs, with placebo, lactate increased, and SvO2, while increasing from initial RP, remained lower than BL. With iNO, SvO2 returned towards BL, and lactate stabilized. * $p < 0.05$ vs BL; § $p < 0.05$ vs Initial RP; # $p < 0.05$ vs group.

	Baseline		Initial RP		4 hr	
	Placebo	iNO	Placebo	iNO	Placebo	iNO
Lactate	1.20(0.24)	1.12(0.23)	3.40(1.17)*	3.08(0.80)*	5.5(1.2)*	3.7(1.2)*,§
SvO_2	63(6)	62(7)	26.4(5)*	29(3.6)*	44.3(6.1)*, §	62(3.3)#,§

Conclusion: These data indicate that by decreasing PVR, iNO decreased RV afterload, preserved RV and LV function, and tissue oxygenation in this simulated hemorrhagic shock and trauma pneumonectomy model in sheep. This suggests that iNO may be a useful clinical adjunct for trauma patients to mitigate right heart failure and improve survival when pneumonectomy is required.

(Supp. in part by Mallinckrodt, DoD/ONR #N000141210810 and #N000141210597)



NOTES

Session: I: Plenary Papers 1-9
Paper 5: 9:10 - 9:30 AM

EFFICACY OF LOW MOLECULAR WEIGHT HEPARIN VS UNFRACTIONATED HEPARIN TO PREVENT PULMONARY EMBOLISM FOLLOWING MAJOR TRAUMA: RESULTS FROM THE AMERICAN COLLEGE OF SURGEONS TRAUMA QUALITY IMPROVEMENT PROGRAM

James P. Byrne MD, Stephanie Mason MD, David Gomez MD,Ph.D., Christopher Hoeft MA, Melanie Neal Avery B. Nathens* MD,Ph.D., Sunnybrook Health Science Centre

Invited Discussant: Steven Shackford, MD

Introduction: Pulmonary embolism (PE) is a leading cause of mortality following major trauma. While low molecular weight heparin (LMWH) is often favored over unfractionated heparin (UH) as prophylaxis against venous thromboembolism (VTE), there is limited level 1 evidence demonstrating superiority over UH to justify its higher cost. This study determined efficacy of LMWH compared to UH to prevent PE in patients admitted to trauma centers participating in the ACS Trauma Quality Improvement Program (ACSTQIP).
Methods: Data for adults with severe injury who received VTE prophylaxis with LMWH or UH were derived from ACSTQIP (2012-2014). Two analytic approaches were used. First, the incidence of PE was compared between propensity score (PS)-matched LMWH and UH groups, balanced for patient baseline and injury characteristics, early surgical interventions, and timing of initiation of pharmacologic prophylaxis. Subgroup analyses included: patients with shock, blunt multisystem injury, penetrating truncal injuries, isolated orthopedic trauma and severe traumatic brain injury. Odds ratios (ORs) for PE and 95% confidence intervals (CIs) were estimated using multilevel mixed models, accounting for matched pairs and clustering of patients within centers. Second, a center-level analysis was performed to determine the risk of PE at centers with increasing utilization of LMWH, while accounting for patient case mix. This analysis answered the question of whether trauma centers with a predilection for using LMWH have lower rates of VTE than centers with a greater preference for UH.
Results: We identified 112,031 patients at 214 trauma centers who received LMWH or UH. LMWH was the most common agent used (74%). Patients with older age, greater comorbidity, fall-related and severe head injuries, intracranial hemorrhage, low GCS scores, and early intracranial interventions were more likely to receive UH. PS-matching yielded a well-balanced cohort of 55,212 patients. LMWH was associated with a significantly lower rate of PE rate compared to UH (1.8% vs. 2.4%; OR 0.70; 95%CI 0.62 – 0.79). This finding was consistent across injury subgroups (Table 1). Our center-level analysis demonstrated that centers with greater utilization of LMWH had lower rates of PE than centers with a greater preference for UH. Specifically, centers in the highest quartile of LMWH utilization (where average 95% of patients received LMWH) had lower rates of PE compared to centers in the lowest quartile of LMWH utilization (where average 42% of patients received LMWH): 1.2% vs. 1.8%; p = 0.02.
Conclusion: Based on these data, VTE prophylaxis with LMWH is associated with lower rates of PE, with a potential to reduce PE rates by more than 25%, compared to prophylaxis with UH. Trauma centers with the greatest utilization of LMWH have lower rates of PE, even after accounting for patient case mix. LMWH should be the preferred agent for VTE prophylaxis after major trauma.

Table 1. Odds of Pulmonary Embolism for Propensity Matched Cohorts

	Crude PE Rate (%)		
Matched Cohort	**LMWH**	**UH**	**OR (95% CI)**
All Patients (n = 55,212)	1.8	2.4	0.70 (0.62 – 0.79)
Shock (n = 3,472)	3.1	4.2	0.67 (0.49 – 0.92)
Blunt Multisystem Injury (n = 16,886)	2.7	3.3	0.75 (0.63 – 0.90)
Penetrating Truncal Injury (n = 3,966)	1.7	2.6	0.49 (0.33 – 0.72)
Isolated Orthopedic Trauma (n = 7,138)	1.0	2.6	0.35 (0.25 – 0.49)
Severe Traumatic Brain Injury (n = 2,732)	0.9	2.1	0.42 (0.21 – 0.84)

NOTES

Session: I: Plenary Papers 1-9
Paper 6: 9:30 - 9:50 AM

SURVEY OF THE AMERICAN COLLEGE OF SURGEONS COMMITTEE ON TRAUMA MEMBERSHIP ON FIREARM INJURY: CONSENSUS AND OPPORTUNITIES

Deborah A. Kuhls* MD, Brendan T. Campbell MD,MPH, Peter A. Burke* MD, Lisa Allee MSW, Barbara A. Gaines* MD, Robert W. Letton* Jr., MD, Mark P. McAndrew MD, Michael L. Nance* MD, Ashley Hink MD, Douglas J. Schuerer* MD, Trudy J. Lerer MS, Ronald M. Stewart* MD, American College Of Surgeons Committee On Trauma

Invited Discussant: Ernest Moore, MD

Introduction: In the U.S. there is a perceived divide regarding the benefits and risks of firearm ownership. The purpose of this survey was to evaluate Committee on Trauma (COT) member attitudes about firearm ownership, freedom, responsibility, physician-patient freedom and policy, with the objective of using survey results to inform firearm injury prevention policy development.

Methods: A 32 question survey was sent to 254 current U.S. COT members by email using Qualtrics. SPSS was used for χ^2, exact, and nonparametric tests, as appropriate with statistical significance being <0.05.

Results: Our response rate was 94%; 43% of COT members have firearm(s) in their home; 87% believe that the ACS should give the highest or a high priority to reducing firearm-related injuries; 86.5% believe healthcare professionals should be allowed to counsel patients on firearm safety. The table summarizes COT surgeon opinions on possible initiatives to prevent firearm violence.

% COT members who strongly agree/agree with advocacy in the following areas	All COT Members	No firearm in home	Firearm in home
Improve mental health treatment to reduce suicides & gun violence	93%	95%	91%
Identify & implement evidenced based injury prevention programs *	93%	97%	87%
Mandatory prosecution of felons who illegally attempt firearm purchase	92%	93%	91%
Increase penalties for illegal gun purchases including gun dealers*	92%	98%	85%
Prevent people with mental health illness from purchasing firearms*	92%	96%	87%
Make funds available for research to understand prevent gun violence*	92%	99%	82%
Preserve health care providers right to counsel patients on gun safety*	90%	95%	84%
Background checks & license/permit for all purchases incl. gun show*	86%	96%	72%

*p <0.05 No firearm in home versus firearm in home

Conclusion: COT surgeons agree on: 1) the importance of formally addressing firearm injury prevention, 2) the majority of policy initiatives targeted to reduce interpersonal violence and firearm injury and 3) allowing healthcare professionals to counsel patients about firearm injury prevention. It should be possible to leverage these consensus-based results to improve firearm injury prevention and responsible firearm ownership by focusing advocacy efforts where trauma surgeons agree.

NOTES

Session: I: Plenary Papers 1-9
Paper 7: 9:50 - 10:10 AM

AN AAST-MITC ANALYSIS OF PANCREATIC TRAUMA: STAPLE OR SEW? RESECT OR DRAIN?

Nickolas Byrge MD, Marta Heilbrun MD, Lindsay M. Cattin MD, Deborah M. Stein* MD, Todd Neideen MD, Carrie A. Sims* MD, Joseph M. Galante* MD, Ajai Malhotra* MD, Gregory J. Jurkovich* MD, Raul Coimbra* MD, Ph.D., Scott F. Gaspard MD, Mackenzie R. Cook MD, Demetrios Demetriades* MD, Ph.D., George C. Velmahos* MD, Ph.D., Ram Nirula* MD, MPH, University of Utah

Invited Discussant: Timothy Fabian, MD

Introduction: Pancreatic trauma results in high morbidity and mortality due to delay in diagnosis, inadequate sensitivity of CT, and organ function. Morbidity due to pancreatic fistula and pseudocyst significantly impact resource utilization. Operative management varies with respect to how the end of the transected pancreas is closed as well as whether drainage rather than resection should be employed for higher grade injuries, but it is unclear which strategy offers the least morbidity and mortality. We therefore sought to determine CT accuracy in diagnosing pancreatic injury and the morbidity and mortality associated with varying operative strategies.

Methods: We created a multi-center robust, retrospective pancreatic trauma registry from 18 level 1 and 2 trauma centers. Adult, blunt or penetrating injured patients surviving>48 hrs from 2005-2012 were analyzed with CTs independently graded by 3 radiologists at the primary site. Sensitivity and specificity of CT scan identification of main pancreatic duct injury was calculated against operative findings. Independent predictors for mortality, ARDS and pancreatic fistula and/or pseudocyst were identified through multivariate regression analysis. Specifically, the association between outcomes and the manner in which the pancreatic injury was managed was measured.

Results: We identified 704 pancreatic injury patients of whom 584 (83%) underwent a pancreas-related procedure. There was modest correlation between CT grade and OR grade (r2 0.38). Preoperative CT was obtained in 54 of 173 patients with surgically diagnosed ductal injury. CT missed 10 ductal injuries (9 grade 3, 1 grade 4) providing 81.5% sensitivity and 60.3% specificity. Independent predictors of mortality were age, ISS, lactate and # of pRBCs transfused. Independent predictors of ARDS were ISS, GCS and pancreatic fistula (OR 5.2, 2.6-10.1). Among grade 3 injuries (n=130, 18.8%) the risk of pancreatic fistula/pseudocyst was reduced when the end of the pancreas was stapled (OR 0.21, 95% CI:0.05, 0.9) compared to sewn and was not affected by the placement of a duct stitch. Despite pancreatic fistula formation in 118 patients (16.9%) ERCP stent placement was only employed in 8 patients (1.1%). There were insufficient numbers of grade 4 (n=25) and 5 (n=24) injuries to identify independent predictors of outcomes; however, mortality was 4.2% and 12% respectively (p=NS). Drainage alone in grade 4 and 5 injuries carried increased risk of pancreatic fistula/pseudocyst (OR 8.3, 95% CI, 2.2, 32.9).

Conclusion: CT is insufficiently sensitive to reliably identify pancreatic duct injury. Patients with grade 3 injuries should have their resection site stapled instead of sewn and a duct stitch is unnecessary. Further study is needed to determine if drainage alone should be employed in grade 4 and 5 injuries.

NOTES

Session: I: Plenary Papers 1-9
Paper 8: 10:10 - 10:30 AM

POTENTIAL IMPACT OF ACA-RELATED INSURANCE EXPANSION ON TRAUMA CARE REIMBURSEMENT: COULD IT BE MORE THAN A BILLION DOLLARS?

John W. Scott MD,MPH, Pooja Upadhyaya BS, MPP, Peter Najjar MBA,MD, Kirstin W. Scott Ph.D., MPhil, David M. Cutler Ph.D., Ali Salim* MD, Adil H. Haider* MD,MPH, The Center For Surgery & Public Health, Brigham & Women's Hospital

Invited Discussant: L.D. Britt, MD, MPH

Introduction: Nearly one-quarter of trauma patients are uninsured and hospitals recoup less than 20% of inpatient costs for their care. This study aims to assess changes to hospital reimbursement for inpatient trauma care if the full coverage expansion provisions of the Affordable Care Act (ACA) had already been in effect.
Methods: Nonelderly adults (ages 18-64y) admitted for trauma were abstracted from the National Inpatient Sample (NIS) during 2010—the last year prior to most major ACA coverage expansion policies. National and facility-level reimbursements and trauma-related contribution margins were calculated using NIS-supplied cost-to-charge ratios and published reimbursement rates for each payer type: Medicare, Medicaid, private, uninsured, other. The pre-ACA expansion model used the observed payer-mix from the 2010 NIS; the post-expansion model used projections based on national census and income data to determine the proportion of currently uninsured patients that would be eligible to gain private insurance, gain Medicaid, or remain uninsured after full implementation of the ACA.
Results: A total of 145,120 patients (representing 734,921 patients nationwide) were included. National inpatient trauma costs totaled $13.8 billion (95%CI: 11.7-16.0). Pre-expansion reimbursements totaled $12.8 billion (10.8-14.7), yielding a national margin of -8.1% (-7.5,-9.2). Post-expansion projected reimbursements totaled $14.4 billion (12.0-16.4), increasing the margin by 11.8 absolute percentage-points to +3.7% (+3.0,+4.4) (**Table**). Of the 259 NIS-sampled facilities with at least 100 patient encounters in 2010, 85 (32.8%) had a positive trauma-related contribution margin in 2010, which would increase to 191 (73.7%) using post-expansion projections. Hospitals in the highest quartile of uninsured patients and those with >50% racial/ethnic minorities experienced the greatest hospital-level margin increases.
Conclusion: Coverage expansion for uninsured trauma patients has the potential to increase national reimbursement for inpatient trauma care by $1.6 billion and double the proportion of hospitals that see a positive margin on delivery of trauma care. These data suggest that insuring the uninsured a critical step to improving trauma centers' financially viability and their ability to provide life-saving care to the communities that they serve.

Table. Difference in trauma-related reimbursement after projected ACA insurance coverage expansion

	Pre-Expansion Model[1]		Post-Expansion Model[2]		Pre-/Post- Difference	
	Value	95% CI	Value	95% CI	Value	95% CI
Financial Estimates						
Inpatient Cost	**$ 13.8 Billion**	(11.7, 16.0)	**$ 13.8 Billion**	(11.7, 16.0)	--	--
Reimbursement[3]	**$ 12.8 Billion**	(10.4, 14.2)	**$ 14.4 Billion**	(12.0, 16.4)	**$ 1.6 Billion**	(1.2, 1.8)
Margin	**-8.1 %**	(-9.8%, -6.5%)	**+3.7 %**	(+3.0%, +4.4%)	**+11.8 %**	(+10.0%, +13.6%)

ACA, Affordable Care Act; ***CI***, confidence interval
1. Pre-expansion model based on 2010 observed payer-mix from NIS for trauma patients of expansion eligible nonelderly adults (ages 18-64). Observed payer mix: 42.3% private, 9.1% Medicare, 15.1% Medicaid, 18.3% uninsured, and 15.1% other.
2. Post-expansion projection model based on Kaiser Family Foundation projections for nonelderly uninsured adults in which 53.3% will gain private coverage, 20.0% will gain Medicaid, and 26.7% will remain uninsured.
3. Derived from previously-published costs, reimbursements, and contribution margins for emergency and trauma care

NOTES

Session: I: Plenary Papers 1-9
Paper 9: 10:30 - 10:50 AM

PLATELET TRANSFUSIONS IN STANDARD DOSES DO NOT PREVENT LOSS OF PLATELET FUNCTION DURING HAEMORRHAGE

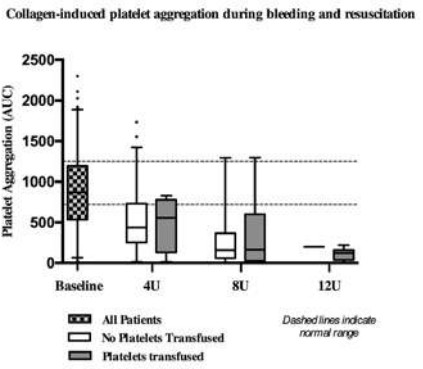
Paul Vulliamy MD, Scarlett Gillespie Ph.D., Karim Brohi* MD, Lewis Gall MD, Ross Davenport MD, Ph.D., Queen Mary University Of London

Invited Discussant: John Holcomb, MD

Introduction: Thrombocytes play a critical role in hemostasis with aberrant function implicated in trauma-induced coagulopathy. Transfusion of platelets to support both count and function is an integral component of hemostatic resuscitation. However, the impact of massive transfusion protocols on platelet function during trauma hemorrhage is unknown. The aim of this study was to characterize the effects of platelet transfusion on platelet aggregation during haemostatic resuscitation.

Methods: Trauma patients enrolled into the prospective Activation of Coagulation and Inflammation in Trauma (ACIT) study and receiving at least four units of packed red blood cells (PRBCs) were included in this study. Patients on antiplatelet therapy were excluded. Blood was drawn in the emergency department within 2 hours of injury and at intervals after every 4 units of PRBCs transfused, up to and including the 12th unit. Platelet aggregation in response to adenosine diphosphate, arachidonic acid, collagen and thrombin receptor activating peptide (TRAP) was assessed in whole blood with multiple electrode aggregometry (the Multiplate™ analyzer). Results are presented as median with interquartile range and compared using the Mann-Whitney U-test.

Results: Of 163 patients who received 4 or more PRBCs as part of their initial resuscitation, 44 received 8-11U and 28 received 12U or more. The median time from admission to platelet transfusion was 90 minutes (63-166). The average ratio of platelets to PRBCs, assuming one apheresis unit to be equivalent to 6U PRBCs, was 0.3 between 0-4PRBCs, 0.9 between 5-8PRBCs and 1.2 between 9-12PRBCs. In patients receiving platelet transfusions (n=107), platelet aggregation in response to stimulation with collagen decreased from 808U (IQR 554-1135) at baseline to 556U (131-778) after 4PRBCs, 163U (26-598) after 8PRBCs and 124U (37-159) after 12U ($p<0.05$ at each time-point compared to baseline, figure; normal range 720-1250U). A similar pattern was observed in response to the other three agonists. Patients who did not receive platelets had similar levels of aggregation in response to all four agonists during hemorrhage at each of the time-points studied ($p>0.05$ compared to patients receiving platelets). Platelet counts also decreased despite platelet transfusion, and were similar at each time-point compared to those not receiving platelets.



Conclusion: Current hemostatic resuscitation strategies do not appear to support platelet function during active haemorrhage. Platelet aggregation declines despite delivery of high ratios of apheresis platelets to PRBCs. Further investigation into the effects of 'up front' platelet transfusion on platelet function and clinical outcomes during bleeding are warranted.

NOTES

WEDNESDAY, SEPTEMBER 14, 2016, 11:00 AM – 12:00 PM

SESSION II: AAST PRESIDENTIAL ADDRESS

LOCATION: GRAND BALLROOM

"A Legacy of Caring"

Grace S. Rozycki, M.D., M.B.A., President
American Association for the Surgery of Trauma

Willis D. Gatch Professor of Surgery
Chief of Surgery, IUH-Methodist Hospital
Department of Surgery
Indiana University School of Medicine
Indianapolis, Indiana

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Presiding: Raul Coimbra, M.D., Ph.D.

AAST President-Elect, 2015-2016

SESSION IIIA:

PAPERS #10 - #19

WEDNESDAY, SEPTEMBER 14, 2016, 1:15 PM – 4:35 PM

GRAND BALLROOM

MODERATOR: EDWARD CORNWELL, III, M .D.

RECORDER: PATRICK REILLY, M.D.

Session: IIIA: Papers 10-19
Paper 10: 1:15 - 1:35 PM

RESULTS OF A MULTICENTER PROSPECTIVE PIVOTAL TRIAL OF THE FIRST IN LINE CONTINUOUS GLUCOSE MONITOR IN CRITICALLY ILL PATIENTS

Grant V. Bochicchio* MD,MPH, Stan Nasraway MD, Laura Moore* MD, Anthony Funary MD, Kelly Bochicchio RN, MSN Washington University School of Medicine

Invited Discussant: Dennis Kim, MD

Introduction: We have previously demonstrated that tight glycemic control (80-120 mg/dl) improves outcome in critically injured trauma patients. However, many centers have gotten away from aggressive glucose control due to the increased workload and risk of hypoglycemia. Our objective of this pivotal trial is to evaluate the first in human continuous inline glucose monitor (OptiScanner) in surgical critically ill and trauma patients.

Methods: A multicenter pivotal trial was conducted over a 1 year period (2014-2015) at 4 major academic centers. 200 critically ill patients admitted to SICU were enrolled. 3765 glucose measurements were obtained by the OptiScanner and then compared to the gold standard Yellow Springs Instrument (YSI). The scanner withdraws 0.13 ml of blood every 15 minutes from a central venous line, centrifuges the sample, and uses mid-infrared spectroscopy to measure glucose. We plotted a Clarke Error Grid, calculated Mean Absolute Relative Deviation (MARD) to analyze trend accuracy, and Population Coefficient of Variance (PCV). OptiScanner and YSI values were “blinded” from clinicians. Treatment was provided by the standard point of care meters.

Results: 95.4% of the data points were in zone A of the Clarke Error Grid and 4.5% in zone B. The MARD was 7.6%, the PCV 9.6%. The majority of data points achieved the benchmark for accuracy. The remaining 4.6% were clinically benign. The MARD was below 10%, which is the first continuous glucose monitor to achieve this result. The PCV was less than 10%, also a first. We confirmed that the OptiScanner outperformed every 1 to 3 hour glucose measurements using meters. This avoids glucose excursions and variability and achieves a higher time in normal range. There were no device related adverse events.

Conclusion: This pivotal multicenter trial demonstrates that the first inline CGM monitor is safe and accurate for use in in critically ill surgical and trauma patients.

NOTES

Session: IIIA: Papers 10-19
Paper 11: 1:35 - 1:55 PM

FIBRINOLYTIC ACTIVATION IN PATIENTS WITH PROGRESSIVE INTRACRANIAL HEMORRHAGE EARLY AFTER TBI

Susan E. Rowell* MD, MCR, David H. Farrell Ph.D., Kelly Fair MD, Cole Hilliard BS, Elizabeth A. Rick BS, Belinda H. McCully, Ph.D., Rondi Dean BS, Amber Laurie Ph.D., Holly Hinson MD, Martin A. Schreiber* MD, Oregon Health & Science University

Invited Discussant: Mitchell Cohen, MD

Background: Progression of intracranial hemorrhage (PICH) is a significant cause of secondary brain injury in patients with traumatic brain injury (TBI). Coagulopathy is a major factor contributing to PICH and worse outcome after TBI yet the mechanism remains unclear. We sought to characterize the coagulation profile in patients with ICH to determine the relationship between specific coagulation pathways and PICH. We hypothesized that patients with PICH would have evidence of fibrinolytic activation that would be associated with an elevated LY30 on viscoelastic testing. **Methods**: We conducted a prospective observational study in adult trauma patients with isolated TBI (head AIS $\geq$3 and $\leq$2 in other regions). Blood was obtained for routine coagulation assays (INR, aPTT), platelet count, fibrinogen, protein C (PC), mediators of thrombin generation (thrombin-antithrombin complexes [TAT], prothrombin fragments 1+2 [F1+2]), mediators of fibrinolysis (D-dimer, plasminogen activator inhibitor-1[PAI-1], tissue plasminogen activator [tPA]) and soluble thrombomodulin (sTM) at admission, 6, 12, 24, and 48 hours. Thromboelastography (TEG) was performed at the same time points. A head CT was performed at admission and 6 hours in all patients and hemorrhage volumes were quantified. ICH progression was defined as a volume increase of at least 30%. Univariate analyses were performed to compare baseline characteristics between groups. Linear regression models were created adjusting for baseline differences between groups (age, gender, ISS, GCS, AIS head, aspirin use) to determine the relationship between individual assays and PICH. Median assay values were plotted over time based on progression status to characterize the temporal profile. **Results**: One hundred and sixty-four patients met entry criteria of which 91 progressed (55%). Patients with PICH were older (55[20] vs 47[22]), had a higher ISS (26[9] vs 19[9]) and AIS head (4[4 vs 5] vs 4[3 vs 4]), and a lower GCS (14[8-15] vs 14[14-15]). No other differences were observed. Patients with PICH had higher D-dimer during the first 24 hours ($p<0.01$at 0, 6, 12, 24 hrs) and higher tPA at 6 hours ($p<0.01$). sTM was lower at all time points in patients with PICH ($p\leq0.05$ at 0, 6, 12, 24, and 48 hours). No differences in other coagulation assays were observed. After adjusting for baseline differences, D-dimer remained elevated in patients with PICH compared to those without PICH at both admission (63% higher, p=0.03, 95% CI 6% to 150%) and 6-hours (50% higher, p=0.03, 95% CI 5% to 114% higher). No differences in LY30 were observed at any time point. The temporal profile of coagulation mediators plotted 48 hours after injury primarily demonstrated differences in mediators of the fibrinolytic pathway. D-dimer peaked at 6 hours and progressively decreased over 48 hours in PICH while remaining low at all time points in non-PICH. Both PAI-1 and tPA were highest at admission and demonstrated a 2-4 fold decrease in both groups over 48 hours. No trends were observed in the temporal profile of all other coagulation mediators. **Conclusion**: The association between PICH and elevated D-dimer early after injury suggest that fibrinolytic activation may in part be responsible for PICH in patients with TBI. The temporal changes observed in both tPA and PAI-1 support fibrinolytic activation and warrant further examination. Contrary to our hypothesis, fibrinolytic activation was not associated with increases in LY30.

NOTES

Session: IIIA: Papers 10-19
Paper 12: 1:55 - 2:15 PM

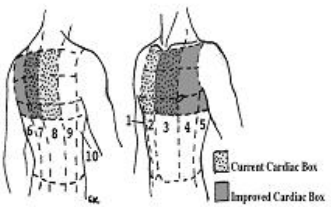
REDEFINING THE CARDIAC BOX: EVALUATION OF THE RELATIONSHIP BETWEEN THORACIC GUNSHOT WOUNDS AND CARDIAC INJURY

Bryan C. Morse MD, MS, Rashi Jhunjhunwala BA, Michael J. Mina Ph.D., Elizabeth Roger BS, Christopher J. Dente* MD, Stacy D. Dougherty MD, Jeffrey M. Nicholas* MD, MS, Amy D. Wyrzykowski* MD, Rondi B. Gelbard MD, David V. Feliciano* MD, Emory University

Invited Discussant: Nicholas Namias, MD, MBA

Introduction: Injuries to the precordium raise concern for cardiac trauma especially for low energy stab wounds with a linear path. However, high energy missiles from gunshots can have a variable trajectory and deeper penetration raising concern for cardiac injury regardless of entrance site. The goal of this study is to assess the adequacy of the anatomic borders of the current "cardiac box" to predict cardiac injury. **Methods**: Retrospective review of trauma registry data of an urban level I trauma center was performed to identify patients with penetrating thoracic gunshot wounds and cardiac injury from 2011-2013. Using a circumferential grid system around the thorax (see figure), logistic regression analysis was first used to compare differences in rates of cardiac injury from entrance/exit wounds in the 'cardiac box' vs. the same for entrance/exit wounds outside the box. The process was then repeated to identify potential regions that yield improved predictions for cardiac injury over the current definition of the "cardiac box". **Results**: Over the 3-year study period, 263 patients sustained 735 penetrating thoracic wounds (89% male, mean age = 34 years, median injuries/person = 2), of which 80% were gunshot wounds (GSWs). After excluding stab wounds, 277 GSWs to the thorax included for study and 95 (34%) injured the heart. Of the 233 GSWs entering the cardiac box, 30% caused cardiac injury while, of the 44 GSWs outside the cardiac box, 32% penetrated the heart, suggesting that the current "cardiac box" is a poor predictor of cardiac injury relative to the thoracic non-"cardiac box" regions (OR 1.1; p=0.71; see Table). The regions from the anterior to posterior midline of the left thorax (regions 3-7, shaded dark gray) provided the highest positive predictive value (0.41) with high sensitivity (90%) and relatively high specificity (31%) while minimizing false positives making this region the most statistically significant discriminator of cardiac injury (OR 4.4; p=0.0001). Missile entrance wounds in zone 5 (left anterior-posterior axillary lines) had the highest individual odds ratio for cardiac injury (OR = 10.1; p=0.0001).

Regions (see figure)	OR	p-value	Sens.	Spec.	PPV
2,3,7,8 (Cardiac box)	1.1	0.7059	.85	.35	.35
2,3,4,5,6,7	6.1	0.0164	.98	.12	.37
3,4,5,6,7,8	9.1	0.0339	.99	.09	.36
3,4,5,6,7,10	4.3	0.0014	.94	.22	.39
3,4,5,6,7 (Improved box)	4.4	0.0001	.90		.41
3,4,5,7	3.6	0.0001	.86	.36	.41
2,3,5,6	3.3	0.0009	.88	.30	.40
2,3,5,7	2.6	0.0090	.88	.25	.38



Conclusion: For GSWs, the current "cardiac box" was the poorest predictor of cardiac injury. We determine that the cardiac box should be redefined to include the area of the thorax that extends from the clavicle to xiphoid & from the anterior midline to the posterior midline of the left thorax. The classic cardiac box is inadequate to discriminate whether a GSW injury will create a cardiac injury.

NOTES

Session: IIIA: Papers 10-19
Paper 13: 2:15 - 2:35 PM

NON-HUMAN PRIMATE (NHP) MODEL OF POLY-TRAUMATIC HEMORRHAGIC SHOCK RECAPITULATES EARLY PLATELET DYSFUNCTION OBSERVED FOLLOWING SEVERE INJURY IN HUMANS

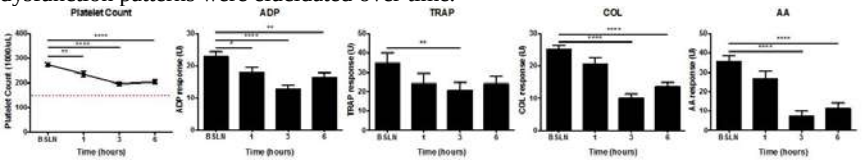
Leasha J. Schaub MS, Andrew P. Cap MD, Ph.D., Jacob J. Glaser MD, Hunter B. Moore MD, Ernest E. Moore* MD, Forest R. Sheppard MD, Naval Medical Research Unit San Antonio

Invited Discussant: Weidun Guo, MD, PhD

Introduction: Platelet dysfunction has been described as an early component of trauma induced coagulopathy (TIC). The platelet component of TIC remains to be fully elucidated and translatable animal models are required to facilitate mechanistic investigations. Our objective was to determine if platelet dysfunction in a non-human primate (NHP) model of poly-traumatic hemorrhagic shock was consistent with that described in humans.

Methods: Rhesus macaques (n=24) underwent severe pressure targeted controlled hemorrhagic shock (PTCHS). A MAP of 20 mmHg was maintained for 1 hour (n=24), with either no additional injury (n=8), a soft tissue injury (ST, n=8), or ST and musculoskeletal injury (ST-MS, n=8) introduced. After 1 hour, resuscitation with 0.9% NaCl and whole blood was initiated. Platelet counts and Multiplate ® assays were performed at baseline (BSLN), end of shock (T=1hr), end of resuscitation (T=3hr), and T=6hr. Results reported as mean±SEM, Stats: Spearmen correlation and One-way RM-ANOVA with $p<0.05$ significant.

Results: Platelet count in all injury groups decreased over time. Weak correlations were observed between platelet response and platelet count for all agonists: adenosine diphosphate (ADP, $r=0.5252$, $p<0.0001$), thrombin recognition activating peptide-6 (TRAP, $r=0.5381$, $p<0.0001$), collagen (COL, $r=0.4718$, $p<0.0001$), and arachidonic acid (AA, $r=0.4718$, $p<0.0001$). Overall, compared to BSLN: platelet response decreased for ADP at T=1hr, all agonist at T=3hr, and for ADP, COL, and AA at T=6hr. Between T=1hr and T=3hr, impaired platelet response was observed for COL and AA. While evaluating the effect of injury severity in combination of shock, specific platelet dysfunction patterns were elucidated over time.



Conclusion: NHPs manifest early platelet dysfunction in response to hemorrhagic shock and tissue injury, which has been observed in severely injured human patients. Additionally, the pattern of injury modifies the effect of specific platelet dysfunction independent of platelet count. NHP models provide a valuable translatable model for understanding the pathophysiology of trauma induced platelet inhibition and additional investigation is underway using NHP models.

NOTES

Session: IIIA: Papers 10-19
Paper 14: 2:35 - 2:55 PM

AUTOMATED VARIABLE AORTIC CONTROL VS. COMPLETE AORTIC OCCLUSION IN A SWINE MODEL OF HEMORRHAGE

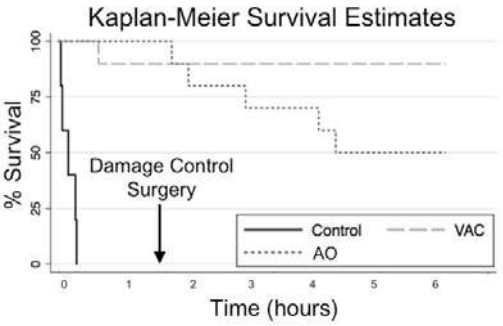
Timothy K. Williams MD, Lucas P. Neff MD, Michael A. Johnson MD, Ph.D., Hilary B. Loge MD, Anders J. Davidson MD, Sarah-Ashley Ferencz MD, Rachel M. Russo MD, Nathan F. Clement MD, John K. Grayson Ph.D., DVM, Todd E. Rasmussen* MD, Clinical Investigation Facility, David Grant Medical Center

Invited Discussant: Thomas Scalea, MD

Introduction: Future endovascular hemorrhage control devices will require features that mitigate the adverse effects of vessel occlusion. Variable aortic control (VAC) is a new approach that adjusts distal aortic perfusion (DAP), minimizes hemorrhage and reduces the ischemic burden of complete aortic occlusion (AO). The objective of this study was to introduce the concept of automated VAC and compare it to (AO) in a lethal model of hemorrhage.

Methods: Twenty-five swine underwent division of the supraceliac aorta - complete aortic occlusion - with diversion of DAP through an automated extracorporeal circuit. After creation of uncontrolled liver bleeding, animals were randomized to 90 minutes of treatment: Control (full, unregulated DAP; n=5), AO (no DAP; n=10), and VAC (regulated DAP initiated after 20 minutes of AO; n=10). In the VAC group, DAP rates were regulated between 100-300mL/min based on a desired, preset range of proximal mean arterial pressure (MAP). At 90 minutes, damage control surgery, resuscitation, and restoration of full DAP ensued. Critical care continued for 4.5 hours or until death. Hemodynamic parameters and markers of ischemia were recorded.

Results: Study survival was 0%, 50%, and 90% for control, AO, and VAC respectively ($p<0.01$) (Figure). During intervention, VAC resulted in lower proximal MAP (84mmHg±18 vs. 104±8mmHg, $p<0.01$), but higher renal blood flow than AO animals ($p=0.02$). During critical care, VAC resulted in higher proximal MAP (73 mmHg±8 vs. 50 mmHg±6, $p<0.01$), carotid and renal blood flow ($p<0.01$), lactate clearance ($p<0.01$), and urine output ($p<0.01$) than AO despite requiring half the amount of fluid to maintain proximal MAP ≥50 mmHg ($p<0.01$). Incidence of spinal cord ischemia was 3-fold higher in animals with AO compared to those with VAC.



Conclusion: Automated distal perfusion beyond complete aortic occlusion minimizes the adverse effects of distal ischemia, optimizes proximal pressure to the brain and heart and prevents exsanguination in this model of lethal hemorrhage. These findings provide foundational knowledge from which step-change technologies in automated, endovascular bleeding control can be assembled.

NOTES

Session: IIIA: Papers 10-19
Paper 15: 2:55 - 3:15 PM

LONG-TERM OUTCOMES OF THORACIC ENDOVASCULAR AORTIC REPAIR (TEVAR): A SINGLE INSTITUTION'S 11-YEAR EXPERIENCE

Megan Brenner* MD, MS, William Teeter MD, Muhammad Hadhud Melanie Hoehn MD, James O'Connor* MD, Deborah Stein* MD, MPH, Thomas Scalea* MD,
University of Maryland Medical Center

Invited Discussant: Demetrios Demetriades, MD, PhD

Introduction: TEVAR has largely replaced traditional open aortic repair for anatomically suitable lesions, however, long-term outcomes are unknown.
Methods: All patients who underwent TEVAR from December 2004-October 2015 at a single tertiary care institution were included. Demographics, injury pattern, operative details, outcomes, and surveillance were reviewed. Follow-up ranged from 2-132 months, and was obtained from clinic notes and imaging reports.
Results: A total of 88 patients underwent TEVAR; all suffered from blunt mechanisms, 72.7% were male. Median age, ISS, TRISS was 47(19.7), 38(13.5), 0.8(0.34). Injuries included 2% grade II, 90% grade III, 8% grade IV. Median ventilator, hospital, and ICU days were 7[3,17], 16.8[8.5,24], and 12.3[5,20]. Overall mortality was 6.8% due to intra-abdominal sepsis (1.1%), cardiac arrest (2.3%), grade 5 liver injury (1.1%), and TBI (2.3%). TEVAR-related mortality was 0%. Overall in-hospital complication rate was 57%. TEVAR-related complication rate was 9.1%: 4 type 1a endoleaks, 2 type 2, and 2 type 3. Of the type 1 endoleaks, all required re-operation, while all type 2 and 3 endoleaks resolved on subsequent imaging. Of the type 1a endoleaks, 1 required proximal extension only, 1 required proximal extension and a left subclavian-carotid artery (LSCA) bypass, and 2 required conversion to open repair despite proximal graft extension. No re-intervention for endoleak was required after TEVARs performed beyond 2009. The left subclavian artery (LSA) was intentionally covered at index operation in 19 patients (21.6%), and 7 patients (8%) had partial LSA coverage. The rate of post-operative left upper extremity ischemia was 0%, and LSCA bypasses were performed prophylactically in 2 patients prior to LSA coverage at index operation. 87% of endograft access was by performed by open femoral artery exposure and 1.1% via retroperitoneal conduit. Percutaneous TEVAR (pTEVAR) for device access was performed more recently in 11.4% of patients with no complications. Heparin was administered intra-operatively in 23 patients with TBI, and 12 patients were not heparinized; no adverse events or outcomes resulted from its use or lack thereof. 66 patients were discharged to rehabilitation centers and 16 patients discharged directly to home. First, second, and third surveillance imaging occurred at mean intervals of 14 days, 4 months, and 1 year, respectively. The longest imaging surveillance was at 8 years, 11 months and 7 days from index operation. Percent of patients followed at 1, 3, 5 years from operation was 62.1%, 25%, 13.6%. The median interval from index operation to most recent imaging was 522 [237, 1127] days (range 4 to 3262 days).
Conclusion: TEVAR continues to be a feasible treatment modality for blunt traumatic aortic injury with few and early TEVAR-specific complications. Device related complications have been significantly reduced as a result of improvements in technology and experience. Follow-up continues to be a significant challenge in this population, and protocols for surveillance imaging are needed. This is the first study to describe short and long term outcomes of pTEVAR exclusively in trauma patients. Long-term outcomes of TEVAR are at least comparable to open repair 11 years after initial intervention.

NOTES

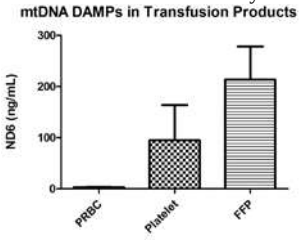
Session: IIIA: Papers 10-19
Paper 16: 3:15 - 3:35 PM

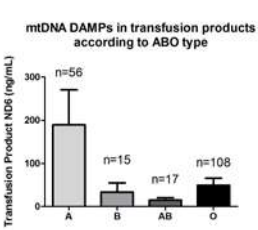
Potential contribution of mitochondrial (mt) DNA Damage Associated Molecular Patterns (DAMPs) in transfusion products to development of the Acute Respiratory Distress Syndrome (ARDS) after multiple transfusions

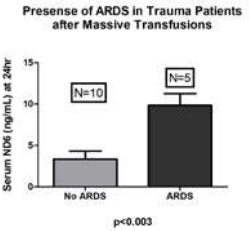
Jon D. Simmons* MD, Viktor M. Pastukh MS, Gina Capley MS, Cherry A. Muscat BS, David C. Muscat BS, Michael L. Marshall BS, Sidney B. Brevard* MD, Mark N. Gillespie Ph.D., University of South Alabama

Invited Discussant: Carl Hauser, MD

Introduction: Observations in the combat casualty management arena suggest that transfusion protocols including equal amounts of packed red blood cells (PRBC) and fresh frozen plasma (FFP), although decreasing acute mortality, are accompanied by an increased incidence of a particularly aggressive and lethal form of acute lung injury (TRALI). The mechanism of delayed TRALI in this setting is unknown, and numerous previous studies have failed to identify potential initiating factors. In light of recent reports showing that mtDNA DAMPs are potent pro-inflammatory mediators, and that their abundance in the sera of severely injured or septic patients is predictive of clinical outcomes, we explored the idea that mtDNA DAMPs are present in transfusion products and are associated with the occurrence of TRALI. **Methods**: We used qPCR to quantify selected 200 bp sequences of extracellular mtDNA in PRBCs, FFP, and platelets. Next, we enrolled fifteen consecutive severely injured patients that received greater than three units of blood transfusion products and determined if the total amount of mtDNA DAMPs delivered during transfusion was correlated with the serum mtDNA measured immediately after the last transfusion, and whether the quantity of mtDNA DAMPs in the serum predicted development of ARDS. **Results**: We found detectable levels of mtDNA DAMPs in PRBCs (3±0.4 ng/mL) , FFP (213.7± 65 ng/mL) , and platelets (94.8±69.2) , with the latter two transfusion products containing significant amounts of mtDNA fragments (Figure-left). The abundance of mtDNA fragments in blood components from Type A donors was significantly more than the others (Figure-middle). There was a linear relationship between the mtDNA DAMPs given during transfusion and the serum concentration of mtDNA fragments (R 2=0.8, $p<0.01$). The quantity of mtDNA DAMPs in serum measured at 24 hours after transfusion predicted the occurrence of ARDS (9.9±1.4 vs 3.3±0.9, $p<0.01$, Figure-right). **Conclusion**: These data show that FFP and platelets contain large amounts of extracellular mtDNA, that the amount of mtDNA DAMPs administered during transfusion may be a determinant of serum mtDNA DAMP levels, and that serum levels of mtDNA DAMPs after multiple transfusions may predict the development of ARDS. Collectively, these findings support the idea that mtDNA DAMPs in transfusion products significantly contribute to the incidence of ARDS after massive transfusions. Furthermore, these data may also suggest that blood components from blood type A donors are more inflammatory than other ABO blood types.







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Session: IIIA: Papers 10-19
Paper 17: 3:35 - 3:55 PM

LONGITUDINAL ANALYSIS OF CIRCULATING MITOCHONDRIAL DNA AS A BIOMARKER IN PATIENTS WITH SYSTEMIC INFLAMMATORY RESPONSE SYNDROME

Mehreen Kisat MD, Bellal Joseph* MD, Tania Contente-Cuomo BS, Zain Khalpey MD,Ph.D., Paul Keim Ph.D., Muhammed Murtaza MD,Ph.D., Peter Rhee* MD,
University of Arizona – Tucson

Invited Discussant: Lawrence Diebel, MD

Introduction: Circulating mitochondrial DNA (mtDNA) levels are elevated in animal models of sepsis. However, the diagnostic utility and clinical role of mtDNA in patients with systemic inflammatory response syndrome (SIRS) is debated and data on serial changes in mtDNA are limited. We hypothesized that longitudinal analysis of circulating mtDNA levels in patients with SIRS or sepsis will correlate with clinical course.

Methods: We conducted a prospective study of 30 consecutive patients suspected of sepsis in the Surgical Trauma ICU and compared with 22 healthy volunteer controls. Longitudinal plasma samples were collected at the time of workup for sepsis (day 0) and on days 7 and 14. Blood samples were collected in Streck Cell-Free DNA tubes and processed within 24 hours. DNA was extracted using QIAamp Circulating Nucleic Acid Kit. We measured mtDNA levels in plasma using real-time quantitative PCR targeting the mitochondrial NADH1 gene. Absolute mtDNA copies were calculated by comparing with known standards, pre-quantified using droplet digital PCR. mtDNA levels were log-transformed and compared between groups using Student *t*-test. Correlation between mtDNA and clinical parameters was explored using multivariate linear regression.

Results: We analyzed 72 serial plasma samples from 30 patients with suspected sepsis. Median mtDNA levels in controls were 602 ± 636 copies/µL of plasma (median ± IQR). In comparison, median mtDNA levels at day 0 in patients with SIRS were 3330 ± 2626 copies/µL (Figure 1, $p<10^{-8}$, area under the ROC curve: 0.936). mtDNA levels were correlated with peripheral WBC count after adjusting for heart rate and temperature (Figure 2, p=0.008). mtDNA levels were elevated in patients with septic shock (systolic BP < 90 mm Hg, p=0.020). In this cohort, 3/30 patients died within the same hospital stay and last recorded mtDNA levels were higher as compared to survivors (Figure 3, p=0.012).

Conclusion: Circulating mtDNA levels in patients with suspected sepsis are five-fold higher than healthy controls. Longitudinal changes in mtDNA are correlated with conventional markers of systemic inflammatory response and can be a biomarker for outcomes.

Figure 1

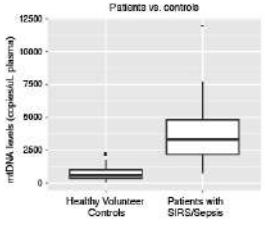


Figure 2

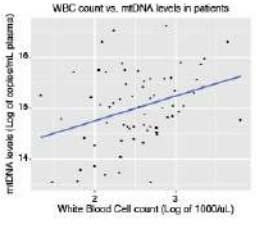
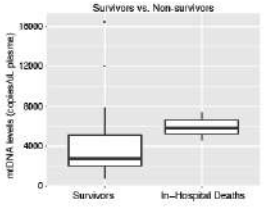


Figure 3



NOTES

Session: IIIA: Papers 10-19
Paper 18: 3:55 - 4:15 PM

HEMORRHAGIC SHOCK DEPLETES AVP STORES AND HORMONAL SUPPLEMENTATION PRESERVES MITOCHONDRIAL FUNCTION

Carrie Sims* MD, Yuxia Guan BS, Evan Werlin MD, Patrick Reilly* MD, University of Pennsylvania

Invited Discussant: Jason Smith, MD

Introduction: Arginine vasopressin (AVP), a hormone secreted by the posterior pituitary, plays an important role in maintaining vasomotor tone during acute blood loss. We hypothesized that hemorrhagic shock results in decreased AVP stores and supplementation during resuscitation would improve blood pressure and renal function.

Methods: Male Long-Evans rats were bled to MAP 40mmHg & maintained until the MAP could not be sustained without fluid. Once 40% of the shed volume (40%SVT) was returned in LR, animals were resuscitated over 60min w/4x the shed volume in LR or the same fluids w/AVP (0.5 U/kg+2 U/kg/hr). Animals (n=5/group) were sacrificed before hemorrhage (Sham), at 40%SVT, following resuscitation (60R, 60R w/AVP) or 18hrs post-resuscitation (18hr, 18hr w/AVP). Pituitaries were harvested and assayed for AVP. Kidney samples were taken to assess mitochondrial function, histology, and oxidative damage. Blood samples were taken to measure AVP levels and renal function.

Results: Baseline pituitary AVP stores (25,606±8894 pg/ml) decreased with severe shock (18,887 ±5,317 pg/ml) and were significantly depressed 18 hrs post resuscitation (9132 ±1486 pg/ml, $p<0.05$). Resuscitation with LR+AVP led to higher serum AVP levels at 60R (31±8 vs 79±12; $p<0.01$) with an improved MAP at 60R (125±3 vs 77±7mmHg;$p<0.01$) and 18hr (82±6 vs 69±5mmHg;$p<0.05$). AVP supplementation preserved complex I respiratory capacity at 60R (103±4 vs 85±5 nmolesO2/min/mg;$p<0.05$) and at 18hrs (98 ±5 vs 80 ±6 nmolesO2/min/mg;$p<0.05$). AVP was also associated with decreased ROS generation at 60R (856±67 vs 622±48F FU) and significantly decreased oxidative damage as measured by mitochondrial lipid peroxidation (0.9±0.1 vs 1.7±0.1 fold change, $p<0.01$) and nitrosylation (0.9±0.1 vs 1.4±0.2 fold change,*$p<0.05$-relative to sham). Although AVP was associated with improved renal histologic architecture at 18hrs, it did not significantly change BUN or creatinine levels.

Conclusions: Pituitary AVP stores decrease following severe hemorrhagic shock and resuscitation. Supplementation with AVP improves blood pressure, preserves renal mitochondrial function and decreases oxidative damage.

NOTES

Session: IIIA: Papers 10-19
Paper 19: 4:15 - 4:35 PM

SYSTEMIC ANTICOAGULATION IN THE SETTING OF VASCULAR EXTREMITY TRAUMA

Melissa N. Loja MD, MAS, Andrew Wishy DO, Misty Humphries MD, Stephanie Savage* MD, MS, Timothy Fabian* MD, Thomas Scalea* MD, John B. Holcomb* MD, Nathaniel Poulin* MD, Joseph M. Galante* MD, Todd E. Rasmussen* MD, AAST PROOVIT Study Group * University of California, Davis

Invited Discussant: David Feliciano, MD

Introduction: There is conflicting data regarding if patients with vascular extremity trauma who undergo surgical treatment need to be systematically anticoagulated. We hypothesized that intraoperative systemic anticoagulation (ISA) does not change the risk of repair thrombosis or limb amputation after traumatic vascular injury of the extremities.

Methods: We analyzed a composite risk of repair thrombosis and/or limb amputation (RTLA) between patients who did and did not undergo ISA and arterial injury repair. Patient data was collected in the AAST PROspective Vascular Injury Treatment (PROOVIT) registry. This registry contains demographic, diagnostic, treatment, and outcome data on patients admitted to one of 14 Level 1 trauma centers, collected prospectively. Multivariate logistic regression analysis was utilized to determine independent risk factors for RTLA. Clinically relevant variables incorporated into the model included age, gender, AIS extremity, concomitant nerve or vein injury, injury location, post-operative antiplatelet or anticoagulation, and type of arterial repair.

Results: Between February 2013 and August 2015, 193 patients with upper or lower extremity arterial injuries who underwent open operative repair were entered into the PROOVIT registry. The majority were male (86%) with a mean age of 32.6 years (range 4-91) and 73.5% injured by penetrating mechanism. 62.6% of the injuries were described as arterial transection and 36.7% had concomitant venous injury. 61.6% of patients underwent ISA. RTLA occurred in 22 patients (11.4%) overall, with no significant unadjusted difference in these outcomes between patients who received ISA and those that did not (12 versus 10, $p = 0.445$). On multivariate logistic regression analysis, ISA did not prove an independent predictor of RTLA. There was, however, significantly higher total blood product use noted among patients treated with ISA versus those that did not receive ISA (5.5 [4.09-6.90] vs. 3.7 [1.58-5.81], $p = 0.003$). There were no deaths in the total cohort.

Discussion: In this multicenter prospective cohort, intraoperative systemic anticoagulation was not associated with a difference in rate of repair thrombosis or limb loss; but was associated with an increase in blood product requirements. Our results suggest that the use of systemic anticoagulation does not change the risk of repair thrombosis or amputation after repair of arterial injuries.

NOTES

SESSION IIIB:

PAPERS #20 - #29

WEDNESDAY, SEPTEMBER 14, 2016, 1:15 PM – 4:35 PM

KONA BALLROOM 4-5

MODERATOR: MICHAEL ROTONDO, M.D.

RECORDER: KAREN BRASEL, M.D., M.P.H.

Session: IIIB: Papers 20-29
Paper 20: 1:15 - 1:35 PM

RESULTS OF A REGIONAL COLLABORATIVE QUALITY INITIATIVE FOR TRAUMA

Mark R. Hemmila* MD, Jill L. Jakubus PA-C, Anne H. Cain-Nielsen MS, John P. Kepros MBA, MD, Michael McCann DO, Wayne E. Vander Kolk MD, Wendy L. Wahl* MD, Judy N. Mikhail Ph.D., RN, University of Michigan

Invited Discussant: Oscar Guillamondegui, MD, MPH

Introduction: Trauma centers and a third party payer within our state built a regional collaborative quality initiative (CQI). This CQI program began as a pilot in 2008 and expanded to a formal program in 2011. Here, we examine the performance of the collaborative over time with regard to patient outcomes, resource utilization, and process measures.

Methods: Data from the initial 23 hospitals that joined the CQI in 2011 were analyzed. Baseline performance was established using the 2011 data. Comparisons were made to unadjusted results achieved in 2014 by the same 23 trauma centers. Risk-adjustment was performed to confirm results observed in the unadjusted data. The relative change in performance from 2011 to 2014 was calculated and is expressed as a percentage decrease or increase. P-values were calculated using chi-squared tests for binary outcomes and t-tests for continuous outcomes. To calculate the number of patients impacted by the CQI program, the relative change was multiplied by the number of trauma patients treated in the 23 hospitals during 2014.

Results: Membership in a CQI program significantly reduced complications and improved process measure execution in trauma patients over four years' time (Table). Similar results were obtained in unadjusted and risk-adjusted analyses. The CQI decreased serious complications by 138 patients/year, eliminated 1,014 mechanical ventilator days, and avoided prophylactic IVC filter placement in 165 patients annually.

Measure	Base Rate	2014 Rate	Relative Change (%)	p-value
Mortality (%)	5.37	5.03	- 6.3	0.3
Serious Complication (%)	8.57	7.37	- 14.0	0.001
Pneumonia (%)	4.29	3.46	- 19.3	0.001
Severe Sepsis (%)	0.92	0.60	- 34.8	0.005
Venous Thromboembolism (%)	1.87	1.27	- 32.1	<0.001
Urinary Tract Infection (%)	3.47	1.75	- 49.6	<0.001
Mechanical Ventilator Days	7.7 ± 10.4	6.8 ± 8.5	- 11.7	0.006
VTE Prophylaxis Initiated ≤ 48 hrs (%)	38.2	47.8	+ 25.1	<0.001
VTE Prophylaxis with LMWH (%)	30.1	36.1	+ 19.9	<0.001
Prophylactic IVC Filter Placement (%)	2.53	1.10	- 56.5	<0.001

Conclusion: This study confirms our hypothesis that participation in a regional collaborative quality initiative improves trauma patient outcomes and decreases resource utilization while promoting compliance with processes of care.

NOTES

Session: IIIB: Papers 20-29
Paper 21: 1:35 - 1:55 PM

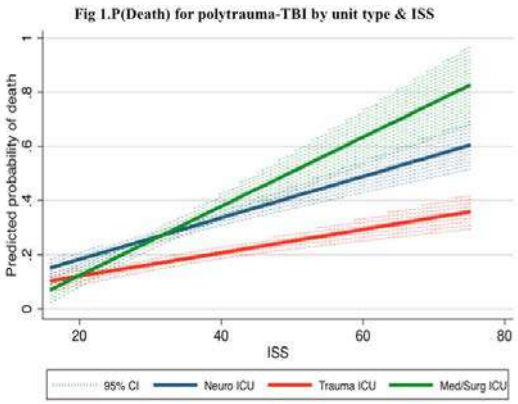
NEURO-, TRAUMA-, OR MED/SURG-ICU: DOES IT MATTER WHERE POLYTRAUMA PATIENTS WITH TBI ARE ADMITTED? SECONDARY ANALYSIS OF THE AAST-MITC DECOMPRESSIVE CRANIECTOMY STUDY.

Sarah Lombardo MD, D Millar MD, Thomas Scalea* MD, Lou Magnotti* MD, Gregory J. Jurkovich* MD, Gary Vercruysse* MD, Jason Sperry* MD,MPH, Kathryn Beauchamp MD, Iman Feiz-Erfan Patrick O'Neill* MD, Raul Coimbra* MD, Ram Nirula* MD,MPH, University of Utah

Invited Discussant: Jennifer Gurney, MD

Introduction: Patients with non-traumatic acute intracranial pathology benefit from neurointensivist care. Similarly, trauma patients with and without TBI fare better when treated by a dedicated trauma team. No study has yet evaluated the role of specialized neurocritical (NICU) and trauma intensive care units (TICU) in the management of TBI patients, and it remains unclear which TBI patients are best served in NICU, TICU, or general (Med/Surg) ICU.

Methods: Twelve Level 1 trauma centers provided clinical data and head CT scans of patients with Glasgow Coma Scale (GCS) ≤13 and CT evidence of TBI. Non-ICU admissions were excluded. Multivariate logistic regression was performed to measure the association between ICU-type and survival and calculate the probability of death for increasing ISS. Polytrauma patients (ISS > 15) with TBI and isolated TBI patients (other AIS<3) were separately analyzed.



Results: There were 3641 patients with CT evidence of TBI with 2951 admitted to an ICU. Prior to adjustment, patient demographics, injury severity, and survival differed significantly by unit type. After adjustment, unit-type, age and ISS remained independent predictors of death (Figures 1 and 2). Unit-type modified the effect of ISS on mortality. TBI-polytrauma patients admitted to a TICU had improved survival across increasing ISS (Fig1). Survival for isolated TBI patients was similar between TICU and NICU. Med/Surg ICU carried the greatest probability of death (Fig2).

Conclusion: Polytrauma patients with TBI have lower mortality risk when admitted to a Trauma ICU. This survival benefit increases with increasing injury severity. Isolated TBI patients have similar mortality risk when admitted to a Neuro ICU compared to a Trauma ICU. Med/Surg ICU admission carries the highest mortality risk.

NOTES

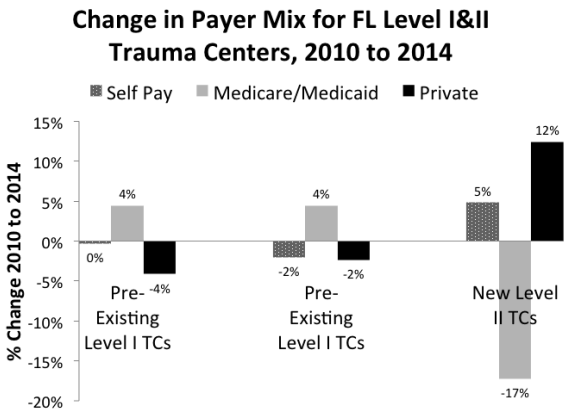
Session: IIIB: Papers 20-29
Paper 22: 1:55 - 2:15 PM

THE TRAUMA ECOSYSTEM: THE ECONOMICS AND IMPACT OF NEW TRAUMA CENTERS ON EXISTING CENTERS

David J. Ciesla* MD, Etienne E. Pracht Ph.D., Pablo T. Leitz MD, David A. Spain* MD, Kristan L. Staudenmayer* MD, University of South Florida

Invited Discussant: Robert Winchell, MD

INTRODUCTION: There is evidence that the establishment of new trauma centers in proximity to existing ones creates economic strain for the original centers; however, this has only been studied in single-center settings. Florida has a mature statewide trauma system and serves as a model for the study of system development. In 2010 there were 7 Adult Level I and 13 Level II Florida trauma centers. An additional 5 Level II trauma centers were designated in 2012. We hypothesized that changes in payer mix and total inpatient charges would be associated with the establishment of new centers close to existing trauma centers.
METHODS: A statewide discharge dataset was queried for all injury related discharges from adult acute care hospitals using ICD-9 codes for 2010 and 2014. Inclusion criteria and definitions of high-risk injury were chosen to match those used by the Florida department of health in its trauma registry. Hospitals were classified as existing Level I (E1) or Level II (E2) trauma centers and New Level II (N2) centers.
RESULTS: Five N2 centers were established 21-107mi from existing centers. Excluding one center 107mi distant, the range was 21-40mi (average 32mi). In 2014 36% were treated at E1, 43% at E2 and 21% at N2. Despite fewer patients, 30% of all trauma charges originated in the 5 N2 centers (36% in 7 E1 and 34% in 13 E2). Total charges increased for E1 centers by $193 million (12%), for E2 by $371 million (28%), and for N2 by $1.1 billion (319%). Payer mix proportions changed from .13/.66/.22 Self/Medicare-Medicaide/Commercial to .16/.54/.30 at N2, from .20/.38/.42 to .20/.43/.37 at E1 and from .13/.50/.37 to .11/.55/.35 at E2.
CONCLUSION: Most new trauma centers were established within 40 miles of an existing Level I or II trauma center. After new centers were established, there was an associated decrease in the number of patients and charges to commercial payers at existing centers. These findings suggest that the health of an entire trauma system must be considered prior to the establishment of new trauma centers.



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Session: IIIB: Papers 20-29
Paper 23: 2:15 - 2:35 PM

THE AIR MEDICAL PREHOSPITAL TRIAGE SCORE: EXTERNAL VALIDATION SUPPORTS ABILITY TO IDENTIFY INJURED PATIENTS THAT WOULD BENEFIT FROM HELICOPTER TRANSPORT

Joshua B. Brown MD, MSc, Mark L. Gestring* MD, Francis X. Guyette MD, MPH, Matthew R. Rosengart* MD, MPH, Nicole A. Stassen* MD, Raquel M. Forsythe* MD, Timothy R. Billiar* MD, Andrew B. Peitzman* MD, Jason L. Sperry* MD, MPH, University of Pittsburgh

Invited Discussant: Jay Doucet, MD, MSc

Introduction: The Air Medical Prehospital Triage (AMPT) score was recently developed to help EMS providers identify injured patients in the field who benefit from helicopter EMS (HEMS) transport to a trauma center from the scene of injury. The AMPT score was developed using the NTDB, however external validation using a different dataset is essential to ensure reliable performance of the score. The Pennsylvania Trauma Outcomes Study (PTOS) registry was selected for this purpose as it offered the ability to critically evaluate the AMPT score with a different case-mix, time period, and more granular trauma dataset. The objective of this study was to validate the effectiveness of the AMPT score to identify patients with a survival benefit from HEMS transport using the PTOS registry.

TABLE 1. Air Medical Prehospital Triage Score

Criterion	Points
Glasgow Coma Scale <14	1
Respiratory Rate <10 or >29 breaths/min	1
Unstable chest wall fractures	1
Suspected hemothorax or pneumothorax	1
Paralysis	1
Multisystem trauma (>2 body regions injured)	1
Any physiologic + any anatomic criterion from National Field Triage Guidelines	2
Consider helicopter transport if AMPT score ≥2 points	

Methods: Patients age ≥16yrs transported from the scene by HEMS or ground EMS (GEMS) in the PTOS registry 2000-2013 were included. The AMPT score was calculated for each patient, and patients with ≥2 points were triaged to HEMS transport, while those with <2 points were triaged to GEMS transport (Table 1). The primary outcome was in-hospital survival. Multilevel logistic regression determined the association of survival with actual transport mode (HEMS vs GEMS), adjusting for demographics, mechanism, vital signs, EMS interventions, injury severity, transfusions, surgery for hemorrhage, and complications. The model was applied separately in patients triaged to HEMS and those triaged to GEMS by the AMPT score. Successful validation was defined as a survival benefit for actual HEMS transport in patients triaged to HEMS by the AMPT score, with no association between survival and actual transport mode in patients triaged to GEMS by the AMPT score. Subgroup analyses were performed in patients treated by only advanced life support (ALS) providers and patients with transport times >10mins.

Results: 222,827 patients were included with 44,351 (20%) undergoing HEMS transport. Overall, 24,328 (11%) of patients were triaged to HEMS transport by the AMPT score. For patients triaged to GEMS transport by the AMPT score (0 or 1 point), actual transport mode was not associated with survival (AOR 1.00; 95%CI 0.82—1.22, p=0.97). For patients triaged to HEMS transport by the AMPT score (≥2 points), actual transport by HEMS was associated with a 31% increase in the odds of survival (AOR 1.31; 95%CI 1.06—1.61, p=0.01). All subgroups had similar results (Table 2).

TABLE 2. Subgroup survival by actual transport mode (HEMS v GEMS)

Subgroup	AOR	95%CI	p value
ALS providers only			
Triaged to GEMS by AMPT	0.99	0.82 – 1.19	0.90
Triaged to HEMS by AMPT	1.31	1.06 – 1.61	0.01
>10-minute transport time			
Triaged to GEMS by AMPT	0.98	0.79 – 1.22	0.89
Triaged to HEMS by AMPT	1.28	1.02 – 1.60	0.03
ALS providers only and >10-minute transport time			
Triaged to GEMS by AMPT	0.97	0.79 – 1.19	0.77
Triaged to HEMS by AMPT	1.29	1.03 – 1.61	0.03

Conclusion: This study is the first to externally validate the AMPT score, demonstrating the ability of this tool to correctly and reliably identify trauma patients most likely to benefit from HEMS transport. The AMPT score should be considered when protocols for HEMS scene response are developed and reviewed.

NOTES

Session: IIIB: Papers 20-29
Paper 24: 2:35 - 2:55 PM

ACS NEEDS BASED ASSESSMENT OF TRAUMA SYSTEMS (NBATS) TOOL: CALIFORNIA EXAMPLE

Tarsicio Uribe-Leitz MD,MPH, Micaela M. Esquivel MD, Naomi Y. Garland MD,MPH, Lisa M. Knowlton MD,MPH, Lakshika Tennakoon MD, Timothy Browder MD, Paul Maggio* MBA,MD, Renee Y. Hsia MD, MSc, Thomas G. Weiser MD,MPH, David Ciesla* MD, David A. Spain* MD, Robert J. Winchell* MD, Kristan L. Staudenmayer* MD, MS Stanford University

Invited Discussant: Michael Rotondo, MD

Introduction: A goal of trauma systems is to best match resources to population need. In 2015, the American College of Surgeons Committee on Trauma convened a consensus conference to develop the Needs Based Assessment of Trauma Systems (NBATS) tool to assist in determining the number of trauma centers (TCs) required for a region. This tool is still being optimized, and has not yet been evaluated. We used the current draft NBATS tool to test the performance of the model with respect to the optimal number of TCs needed by region in California. We hypothesize that the NBATS tool will differentiate between regions based on estimated need.

Methods: We obtained TC data and population data from the California Emergency Services Authority. Numbers of admitted trauma patients (ISS >15) were obtained using statewide non-public admissions data from the California Office of Statewide Health Planning and Development (OSHPD). We used Local Emergency Medical Service Agency (LEMSA) for regional trauma service areas. Spatial analyses were done in ArcGIS to geocode median transport times based on existing road networks. NBATS criteria used included population, transport time, community support, and number of discharges for severely injured patients (ISS >15) at non-TCs. This score was adjusted depending on the presence and use of Level I- III TCs.

Results: A total of 74 designated TCs were identified for California-- 15 (20.3%) Level I, 37 (50%) Level II, 14 (18.9%) Level III and 8 (10.8%) Level IV. According to the NBATS scoring system, four (12.1%) LEMSAs had an adequate number of TCs, and 26 (78.8%) had scores that suggesting that additional trauma centers were needed. Of these regions, 9 (27.3%) would require 1 additional TC, thirteen (39.4%) would require 2 additional TCs, and 4 (12.1%) would require 3 more TCs. In 3 LEMSAS (9.1%), the model suggested there were already more TCs than required.

Conclusion: To our knowledge, this is the first application of the NBATS tool to a statewide trauma system, using data available to the lead agency. We propose the use of GIS methodology as way to refine the access parameters of the model. The tool identified regions that would require additional TCs. Just as importantly, it identified regions that required no further TCs and 3 regions with more TCs than predicted by the model. While the NBATS tool requires development, validation, and further study, results from the current study suggest the tool may be helpful in the characterization and assessment of statewide trauma needs.

NOTES

Session: IIIB: Papers 20-29
Paper 25: 2:55 - 3:15 PM

Compliance with Triage Directions from an Organized State Trauma Communication Center Improves Trauma Patient Outcomes

Benjamin R. Martinez MD, Shoichiro Tanaka MD,MPH, Margaret Moore MD, Patrick Greiffenstein MD, John T. Owings* MD, FACS, John P. Hunt* MD,MPH, Chris Hector NRP, Paige Hargrove RN, BSN LSU Department of Surgery

Invited Discussant: Robert Mackersie, MD

Background: The Louisiana Emergency Response Network (LERN) is a state agency created by the State Legislature in 2004. Its purpose is to develop and maintain a statewide system to triage patients with "time-sensitive illness" (myocardial infarction, stroke, and trauma) and oversee disaster preparedness. Trauma was LERN's first "time sensitive illness" for which around-the-clock hospital destination data were provided. LERN has a single communication center (LERN-CC) that takes all calls from pre-hospital and hospital providers from the entire state and identifies the most appropriate destination for their patient. In 2014 the LERN trauma triage protocol was essentially the same as the CDC trauma triage protocol. The medics staffing LERN's communications center provided direction based on this protocol. The purpose of our study was to compare outcomes between those patients who complied with the LERN triage protocol and those who did not.

Methods: All patients entered into the LERN database as trauma patients and given pre-hospital triage instructions were initially included. We then excluded patients that were determined not to be trauma patients and those for whom the initial LERN call was from a hospital. Patients who followed the LERN trauma triage criteria were defined as the compliant group. Patients initially brought to a hospital **inconsistent** with the LERN trauma triage protocol defined as the noncompliant group (whether due to EMS discretion or patient request). We performed a Chi-Square analysis to compare differences between these two groups. Both identification of the outcome measures and establishment of a p-value of < 0.05 as statistically significant were determined before the beginning of the study.

Results: During 2014, pre-hospital/hospital providers called LERN for direction in the care of 14, 935 patients. We excluded 692 patients from our study because they were not trauma patients and 172 patients because their initial call came from a hospital. Our study, therefore, consists of 14,071 patients who were identified by the LERN call center as trauma patients and were triaged to a specific hospital. Of these patients, 13, 037 (92.7%) patients were compliant with the LERN protocol and 1,034 (7.3%) patients were noncompliant. The mechanism of injury and demographic parameters were not significantly different between the two groups. There were significantly fewer patients in the compliant group 570 **(4.3%)** who required transfer from their initial hospital to a second hospital than there were in the noncompliant group 312 **(30.2%)**, $p<0.01$. The mortality rate was significantly lower in the compliant group 81 **(0.6%)** than in the noncompliant group 21 **(2.03%)**, $p<0.01$.

Conclusion: Following a recognized trauma triage criteria resulted in a decreased need for secondary transfers. More importantly getting the patient to the correct hospital in a timely fashion resulted in a fivefold decrease in mortality. These data emphasize the value of an organized statewide trauma network that routes patients to the appropriate facilities. These data also support the American College of Surgeons perspective that minimizing secondary trauma transfers improves trauma patient outcomes.

NOTES

Session: IIIB: Papers 20-29
Paper 26: 3:15 - 3:35 PM

ACS LEVEL I TRAUMA CENTERS OUTCOMES DO NOT CORRELATE WITH PATIENT PERCEPTIONS OF HOSPITAL EXPERIENCE

Bellal Joseph* MD, Asad Azim MD, Ansab Haider MD, Narong Kulvatunyou* MD, Terence O'Keeffe* MD, Lynn Gries MD, Gary Vercruysse* MD, Andrew Tang MD, Peter Rhee* MD, MPH, University of Arizona – Tucson

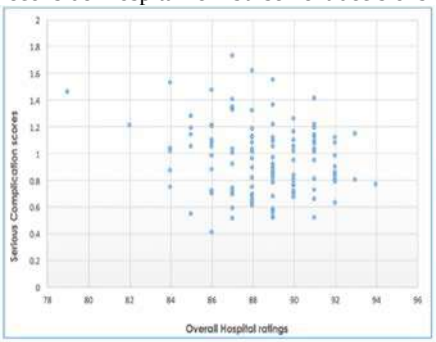
Invited Discussant: Frederick Rogers, MD

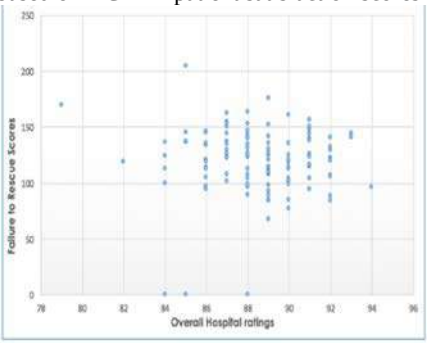
Introduction: HCAHPS is a data collection methodology for measuring patient's perception of their hospital experience and has been selected by Centers of Medicare and Medicaid Services (CMS) as the validated and transparent national survey tool with publicly available results. Beginning in 2012 hospital reimbursements rates are linked to HCAHPS data, which is based on patient satisfaction scores. The aim of this study was to assess whether HCAHPS scores of Level-1 trauma centers correlate with actual hospital performance.

Methods: We performed retrospective analysis of latest publicly available HCAHPS data (2014 – 2015). All ACS verified Level-I trauma centers for each state were identified from ACS registry and following data points were collected for each hospital. HCAHPS linear mean scores regarding cleanliness of the hospital, doctor and nurse communication with the patient, staff responsiveness, pain management, overall hospital rating and patient willingness to recommend the hospital. Primary outcome measure was serious complication score. Secondary outcome measures were failure-to-rescue scores and readmission after discharge scores. Spearman correlation analysis was performed.

Results: A total of one hundred and twenty ACS verified Level-I trauma centers across 46 states were included. Median [IQR] overall hospital rating score for Level-I trauma centers was 89 [87-90]. Mean ± SD score for serious complication was 0.96±0.266, failure-to-rescue was 123.06±22.5, and readmission after discharge was 15.71±1.07. On performing spearman correlation overall HCAHP based hospital rating scores did not correlate with serious complications (correlation coefficient = 0.171 p= 0.064), readmission after discharge (correlation coefficient = -1.79 p= 0.052) and failure-to-rescue (correlation coefficient = -0.188 p= 0.043).

Conclusion: Our findings suggest that no correlation exists between HCAHPS patient satisfaction score and hospital performance for level I trauma centers. CMS should reconsider hospital reimbursement decisions based on HCAHP patient satisfaction scores





NOTES

Session: IIIB: Papers 20-29
Paper 27: 3:35 - 3:55 PM

ATTEMPTING TO VALIDATE THE OVER/UNDER TRIAGE MATRIX AT A LEVEL I TRAUMA CENTER

James W. Davis* MD, Rachel Dirks Ph.D., Lawrence P. Sue MD, UCSF Fresno

Invited Discussant: Eileen Bulger, MD

Introduction: The Optimal Resources Document (ORD) mandates criteria for trauma activation that are based on mechanism and physiologic and anatomic criteria. The ORD then requires the retrospectively calculated Injury Severity Score (ISS) to evaluate the appropriateness of tiered trauma activation using the over/under triage matrix (Matrix).The COT recommends a goal of < 50% over triage and < 5% under triage. We hypothesized that the ISS-driven Matrix does not reflect outcomes and risk of delayed treatment with under triage. The purpose of this study was to assess the utility of the Matrix by comparing results of tiered activation with those 'appropriately triaged' and 'under triaged' by Matrix.

Methods: Trauma registry data were reviewed from 1/2013- 12/2015 at an ACS verified Level I trauma center with ACS tiered activation criteria. Patients with an ISS ≥ 16 were classified by activation level (full, limited, consultation), and triage category calculated by Matrix. Under triage rate by Matrix methodology is patients with an ISS ≥ 16 without full activation/all patients without full activation. Patients were compared by demographics, injuries, initial vital signs, procedures, delays to procedure, ICU admission, hospital lengths of stay (LOS), and mortality. Data are presented as mean ± SD or median [IQR]. Statistical analysis was performed using Chi square and Mann Whitney U tests with significance attributed to a p value < 0.05.

Results: 7031 patients had trauma team activation. Overall compliance with the ACS tiered activation criteria was 99%. By Matrix, the under triage rate was 24%. Of 2282 patients with an ISS ≥ 16, 1,025 were appropriately triaged (full activation), and 1257 were under triaged (379 limited activation and 878 consultation).

Matrix	Appropriate triage	Under triaged	Under triaged
ACS criteria	Full activation	Limited activation	Consultation
N	1025	379	878
Age	39 ± 20	43 ± 22*	51 ± 23*
GCS	6 [3-15]	15 [13-15]*	15 [14-15]*
ISS	26 [21-33]	22 [17-27]*	19 [17-24]*
Heart rate	98 [78-120]	91 [78-108]*	86 [74-99]*
SBP	105 [80-130]	124 [111-140]*	132 [120-148]*
Base Deficit	-5 [-8 - -2]	-3 [-5 - -1]*	-2 [-4 - -1]*
Exlap/Crani	367 (36%)	93 (25%)*	126 (14%)*
Delay to Exlap/Crani	29 (3%)	1 (0%)*	9 (1%)*
ICU admission	735 (72%)	195 (51%)*	271 (31%)*
Hospital LOS	14 ± 15	12 ± 13	7 ± 8*
Mortality	332 (32%)	27 (7%)*	30 (4%)*

*p < 0.005 compared to appropriate triage

Conclusion: Tiered response criteria for trauma team activation appropriately identified patient acuity and outcomes without causing treatment delays in limited activations and consultations. The Matrix had poor agreement with ACS-COT trauma team activation criteria. Compliance with the ACS-COT activation criteria should be used to evaluate under triage rather than the ISS-driven Matrix.

NOTES

Session: IIIB: Papers 20-29
Paper 28: 3:55 - 4:15 PM

SUICIDE SECONDARY TO FIREARMS: WEAKER GUN STATE LAWS ARE ASSOCIATED WITH INCREASED RATES OF DEATH

Rodrigo F. Alban* MD, FACS, Galinos Barmparas MD, Ara Ko MD,MPH, Cedars-Sinai Medical Center

Invited Discussant: Ronald Gross, MD

Introduction: Firearm related violence remains a significant cause of death and injury in the U.S. According to the CDC nearly two thirds of gun deaths are suicides, and they outnumber firearm homicides nearly two to one. In addition, suicide is the 10th leading cause of death in the U.S. among adolescents and young adults aged 10-24 years. With significant controversy, several states have mandated different laws to restrict gun ownership. In order to determine a more objective method to understand suicide estimates and outcomes at a national level we sought to examine the relationship in firearm related injuries amongst states based on their firearm law patterns.

Methods: We reviewed the National Inpatient Sample (NIS) database from 2010-2011 for all firearm related injury codes (ECODES) with the exception of law-enforcement related firearm injuries. ECODES included suicide, assault, accidental and undetermined. State related firearm laws were scored using the Brady scoring system from A (stricter laws) to F (weaker laws). Patient demographic information, location (by state), and mortality were analyzed in these 5 groups (A, B, C, D and F). The U.S. Census Bureau was used to calculate weighted estimates of injury per 100,000 population for the year 2010 and 2011 based on the abstracted NIS ECODES.

Results: A total of 60,945 weighted counts were identified nationwide during the study period. Overall suicide rates were significantly higher in states with weaker gun laws (grade F) when compared with states with stricter gun laws (grade A): 2.59/100,000 vs. 0.82/100,000 ($p<0.001$). Suicide-related mortality was nearly 3-fold higher in grade F (0.98/100,000) vs. grade A (0.34/100,000) states, $p<0.001$. In addition, states with grades C and D were also noted to have increased rates of suicide-related mortality when compared with grade A states (0.78/100,000 and 0.50/100,000 vs. 0.34/100,000, respectively, $p<0.001$). In patients younger than 25 years old, we noted a higher incidence of all firearm related injuries in grade A vs. grade F states (12.58/100,000 vs. 8.76/100,000, $p<0.001$). Despite this higher overall incidence, suicide-related mortality secondary to firearm injuries was significantly lower in grade-A states compared to grade-F states (0.14/100,000 vs. 0.54/100,000, $p<0.001$).

Conclusion: Firearm related suicide injuries are more common in states with weaker gun laws; most importantly suicide deaths due to firearms were significantly higher in these states. Efforts aimed at nationwide standardization of firearm state laws are warranted, particularly for young adults and suicide-prone populations.

NOTES

Session: IIIB: Papers 20-29
Paper 29: 4:15 - 4:35 PM

UTILITY OF THE INJURED TRAUMA SURVIVOR SCREEN TO PREDICT PTSD AND DEPRESSION IN HOSPITALIZED TRAUMA PATIENTS

Terri A. DeRoon-Cassini Ph.D., Josh Hunt Ph.D., Ann Marie Warren Ph.D., Karen Brasel* MD, MPH, Medical College of Wisconsin

Invited Discussant: Ronald Stewart, MD

Background: The American College of Surgeons Committee on Trauma has recommended PTSD and Depression screening for admitted trauma survivors, yet a brief screening tool validated on hospitalized trauma patients to predict PTSD and Depression does not exist. The purpose of this study was to evaluate the utility of a brief new screening tool for PTSD and Depression.

Methods: 276 trauma patients admitted to two Level I trauma centers completed the newly created 9-item Injured Trauma Survivor Screen for PTSD and depression (5 items for PTSD, 5 items for Depression, with 1 overlapping item), as well as injury and demographic information. At 1 (n=137) and 6 (n=99) months posttrauma the gold standard for assessing PTSD (CAPS) and the Center for Epidemiologic Studies Depression – Revised measure (CESD-R) of depression were administered. ROC curve analysis and sensitivity and specificity were utilized.

Results: The rate of depression was 20% (n = 28) and the rate of PTSD was 28.7% (n = 40). Of those who met PTSD criteria at one month (n = 40) based on their CAPS-5 score, 55% (n = 22) met criteria for comorbid depression based on their score responses to the CESD-R ($\chi 2(1) = 42.418$, $p < 0.001$), $\varphi = 0.552$). The new 9 item Injured Trauma Survivor Screen (ITSS) for PTSD and Depression administered in the hospital within 4 days of injury demonstrated a 75% sensitivity for identifying risk for PTSD and Depression, 94% specificity for PTSD and 96% specificity for depression, with a cut-off score of 2 out of 5 based on a ROC curve analysis.

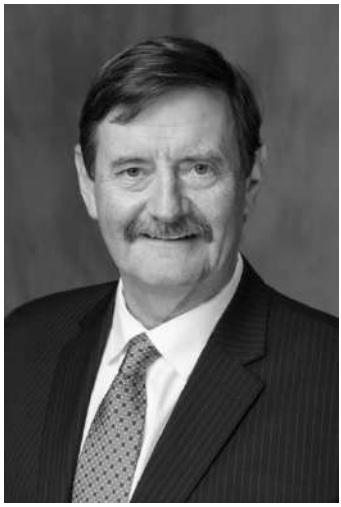
Conclusions: The newly created 9 item Injured Trauma Survivor Screen demonstrated strong sensitivity and specificity for predicting PTSD and Depression when administered during hospitalization following injury. The ITSS takes less than 5 minutes to administer and is a reliable solution validated on a population it is intended to be used. Trauma centers should consider adopting this screening tool to meet the ACS-CoT recommendations.

NOTES

WEDNESDAY, SEPTEMBER 14, 2016, 4:45 PM – 5:15 PM

SESSION IV: MASTER SURGEON LECTURE

LOCATION: GRAND BALLROOM



"NIH P-50 Sponsored Team Science in Multiple Organ Failure"

Frederick A. Moore, M.D.

Professor of Surgery
Head of Acute Care Surgery
University of Florida College of Medicine
Gainesville, Florida

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SESSION V:

POSTER SESSION

WEDNESDAY, SEPTEMBER 14, 2016, 5:15 PM – 7:00 PM

LOCATION: GRAND PROMENADE

Poster #	Professors	Category
1-10	David Harrington, MD Mark Shapiro, MD	Abdominal Trauma and Burns
11-19	Matthew Martin, MD, Charles Adams, Jr., MD	Acute Care Surgery
20-31	Eric Ley, MD Sarah Majercik, MD, MBA	Acute Care Surgery and Critical Care
32-42	Ajai Malhotra, MD, M.Sc., MBBS Laura Moore, MD	Critical Care
43-53	Jonathan Tilsed, MD Donald Jenkins, MD	Extremity and Vascular
54-63	Deborah Stein, MD, MPH Jason Sperry, MD, MPH	Neurotrauma
64-72	Robert Barraco, MD, MPH Hans-Christoph Pape, MD	Outcomes/Guidelines I
73-82	Avery Nathens, MD, MPH, PhD Shahid Shafi, MD	Outcomes/Guidelines II
83-92	Andrew Kerwin, MD Andre Campbell, MD	Outcomes/Guidelines III and Shock
93-101	Barbara Gaines, MD James Betts, MD	Pediatric Trauma
102-111	Amy Goldberg, MD Timothy Browder, MD, MPH	Shock
112-121	Roxie Albrecht, MD Richard Miller, MD	Socioeconomics, Ethics & Thoracic
122-130	Rochelle Dicker, MD Joan Pirrung, RN, MSN	Trauma Education and Prevention
131-140	Eric Voiglio, MD, PhD Garth Utter, MD	Trauma Systems

SESSION VI:

PAPERS #30 - #39

THURSDAY, SEPTEMBER 15, 2016, 7:30 AM – 10:50 AM

GRAND BALLROOM

MODERATOR: GRACE ROZYCKI, M.D., M.B.A.

RECORDER: DAVID SPAIN, M.D.

Session: VI: Plenary Session Papers 30-39
Paper 30: 7:30 - 7:50 AM

EXOSOMES, NOT PROTEIN OR LIPIDS, IN MESENTERIC LYMPH ACTIVATE INFLAMMATION: UNLOCKING THE MYSTERY OF POST-SHOCK MULTIPLE ORGAN FAILURE

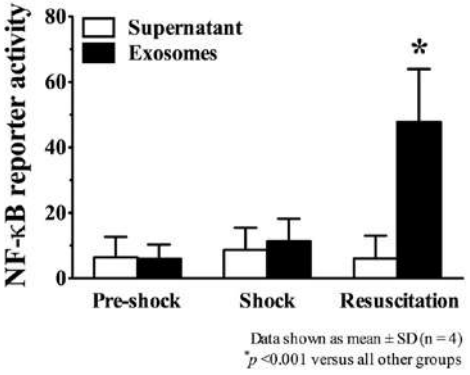
Mitsuaki Kojima MD, Joao A. Gimenes-Junior Ph.D., Todd W. Costantini* MD, Simone Langness MD, Ophelie Z. Lavoie Gagne BS, Koji Morishita MD, Brian P. Eliceiri Ph.D., Andrew Baird Ph.D., Raul Coimbra* MD, Ph.D., University of California, San Diego

Invited Discussant: David Livingston, MD

Introduction: Post-shock organ failure is the leading cause of late mortality in trauma patients. Studies have shown that mesenteric lymph (ML) plays a crucial role in driving the systemic inflammatory response after trauma/hemorrhagic shock (T/HS). The specific mediators in the ML that contribute to its biological activity remain unclear despite decades of study. Exosomes are extracellular microvesicles that are shed into body fluids such as serum and urine, play an important role in intercellular communication, and have immunomodulatory effects. We hypothesized that exosomes are present in the ML after trauma/shock and are responsible for the biological activity of ML.

Methods: Male rats underwent cannulation of the femoral vessels and mesenteric lymph duct prior to T/HS (mean arterial pressure 35 mmHg for 60 min), followed by resuscitation with shed blood and 2 times normal saline. The ML was collected during 3 distinct time periods (pre-shock, shock and resuscitation phase) and subsequently separated into exosome and supernatant fractions by differential centrifugation. Exosomes were visualized and quantified using nanoparticle tracking analysis and by immunoblotting for exosome markers CD63 and HSP70. The biological activity of ML exosomes and supernatant were characterized using a monocyte NF-κB reporter assay and by measuring macrophage intracellular TNF-α production using flow cytometry.

Results: Exosomes were identified in ML by size (96.3 ± 40.1 nm) and expression of the exosome markers CD63 and HSP70. The number of exosomes present in the ML was increased during shock (1.5 x 1011, $p<0.05$) compared to pre-shock (6.5 x 1010) and resuscitation (6.6 x 1010) phases. However, biological activity of exosomes isolated during the resuscitation phase was markedly increased and caused an 8-fold increase in monocyte NF- κB activation compared to supernatant ($p<0.001$, see figure). Macrophage TNF-α production was also increased after exposure to exosomes harvested in the resuscitation phase ($p<0.05$). The ML supernatant fraction had no effect on macrophage TNF-α production during any phase.



Conclusion: Exosomes are released into the ML after injury and demonstrate increased biological activity during resuscitation. Our findings show that exosomes, and not the liquid fraction of ML, are the major biological active component triggering the systemic inflammatory response after T/HS.

NOTES

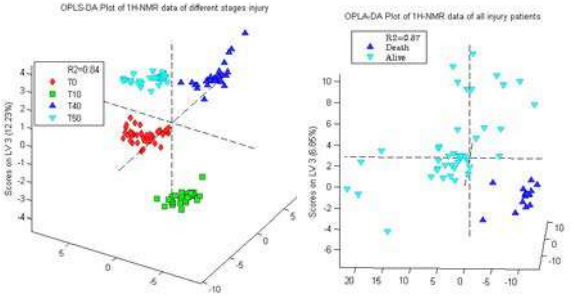
Session: VI: Plenary Session Papers 30-39
Paper 31: 7:50 - 8:10 AM

A STUDY OF METABOLIC DYNAMICS IN CRITICALLY INJURED PATIENTS

Kai WANG DO, MD, Mingwei SUN MD, Charles D. Lu, Ph.D., Jun ZENG, MD,
Sichuan Academy Of Medical Sciences.

Invited Discussant: David Harrington, MD

Introduction: By combining the techniques of metabolomics and computational biology, this research aims to explore the mechanism of metabolic dynamics in critically injured patients and develop a new method for early warning for mortality.
Methods: A prospective cohort study was conducted, a group of critically injured patients were included, and their serum samples were collected for 1H-NMR metabolomics (DRX 600MHz NMR ,Bruker Biospin Rheinstetten, Germany) analysis. The data was processed with partial least squares regression and support vector machine, to explore the role of enzyme-gene network regulatory mechanism in critically injured metabolic network regulation and to build a quantitative prediction model for early warning of fast death. The survival percentage was estimated using Kaplan-Meier curves.
Results: In total, 60 patients were enrolled between January 2013 and December 2014 and were divided into three groups: 19 patients with severe traumatic brain injury, 26 patients with thoracic or abdominal surgery and 15 patients with severe burns. Age, body mass index (BMI) and APACHE II scores were not significantly different between groups. The survival percentage of patients with severe burns is significantly different from the other two groups ($P<0.01$). There were significant differences in plasma metabolome between the surviving patients and deceased ones (Figure 1). Compared to the surviving patients, disturbances of neopterin, corticosterone, 3-methylhistidine, homocysteine, Serine, tyrosine, prostaglandin E2, tryptophan, testosterone and estriol, were observed in the plasmas of deceased ones. Six metabolic markers (neopterin, 3-methylhistidine, prostaglandin E2, homocysteine, testosterone and estriol) were significantly different. GO analysis showed that 66 enzymes and genes regulated the 6 key metabolic markers. Among patients of different injury stages, there were significant differences in plasma metabolome (Figure 2). From T0 to T50 stages of injury, increased levels of neopterin, corticosterone, prostaglandin E2 and estriol, together with decreased levels of homocysteine, tryptophan and testosterone, were observed. Eventually, the quantitative prediction model of death warning was established. Cross-validation results showed that the predicted effect was good (RMSE=0.18408, R2=0.87 P=0.036).
Conclusion: Systems biology approaches based on metabolomics and enzyme-gene regulatory network analysis can be used to quantify the metabolic dynamics of patients with critically injuries and to predict death of critically injured patients by plasma 1H-NMR metabolomics.



NOTES

Session: VI: Plenary Session Papers 30-39
Paper 32: 8:10 - 8:30 AM

PREPERITONEAL PELVIC PACKING REDUCES MORTALITY IN PATIENTS WITH LIFE-THREATENING HEMORRHAGE DUE TO UNSTABLE PELVIC FRACTURES

Clay Cothren Burlew* MD, Andrea E. Geddes BA, Ernest E. Moore* MD, Amy E. Wagenaar MD, Jeffrey L. Johnson* MD, Fredric M. Pieracci MD, Charles Fox* MD, Eric M. Campion MD, Philip F. Stahel* MD, Denver Health Medical Center

Invited Discussant: David Spain, MD

Introduction: A 2015 AAST multicenter trial reported a 32% mortality rate for complex pelvic fracture patients who present in shock. Angioembolization is the most common intervention for hemorrhage control; in 2015 the Maryland Shock Trauma group revealed time to angioembolization averaged over 5 hours. The goal of this study was to evaluate the time to intervention and outcomes of an operative approach to hemorrhage from pelvic fractures. We hypothesized direct preperitoneal pelvic packing (PPP) results in a shorter time to intervention and lower mortality.

Methods: In 2004 we initiated a protocol in pelvic fracture patients employing PPP as the initial management for pelvic bleeding with hemodynamic instability despite 2 units of blood transfusion. Patients with prehospital arrest/emergency department thoracotomy who subsequently underwent PPP were excluded.

Results: During the 11 year study period, 2293 patients were admitted with pelvic fractures; 128 (6%) consecutive patients underwent PPP (mean age 43 ± 2 years and ISS 48 ± 1.2). The lowest mean emergency department SBP was 74 ± 2 mmHg and highest heart rate was 120 ± 2. Median time to operation was 44 minutes. An additional 3 ± 0.2 operative procedures were performed in 109 (85%) patients aside from external fixation and PPP. Median red cell transfusions prior to PPP completion compared to the subsequent 24 postoperative hours were 8 units versus 3 units ($p<0.05$). After PPP, 16 (13%) patients underwent angioembolization (AE) with a documented arterial blush. One patient had perineal necrosis from empiric bilateral internal iliac artery embolization. Mortality in this high-risk group was 21%. Death was due to traumatic brain injury (9), multiple organ failure (4), withdrawal of support (4), pulmonary failure (3), cardiac failure (3), adverse physiology (3), and invasive Mucor infection (1). Of those patients with adverse physiology, 2 died in the operating room at 89 minutes and 100 minutes after hospital arrival while 1 died in the ICU 9 hours after arrival.

Conclusion: PPP results in a shorter time to intervention and lower mortality compared to modern series utilizing AE. Examining mortality, only 3 (2%) deaths were attributed to the immediate sequelae of bleeding with physiologic failure. With time to death under 100 minutes in 2 of those patients, AE is unlikely to have been feasible. Furthermore, arterial bleeding was present in the minority of patients, rendering angiography of limited utility. PPP should be utilized for pelvic fracture related bleeding in the patient who remains hemodynamically unstable despite initial blood transfusion.

NOTES

Session: VI: Plenary Session Papers 30-39
Paper 33: 8:30 - 8:50 AM

PELVIC FRACTURE PATTERN PREDICTS THE NEED FOR HEMORRHAGE CONTROL INTERVENTION - RESULTS OF A MULTI-INSTITUTIONAL STUDY

Todd W. Costantini* MD, Raul Coimbra* MD, Ph.D., John Holcomb* MD, Richard Catalano MD, Thomas M. Scalea* MD, Lashonda Williams MD, Scott Keeney DO, Jason Sperry* MD, MPH, Dimitra Skiada MD, Brian H. Williams MD, Robert C. Mackersie* MD, Forrest Moore* MD, Pelvic Fracture Study Group AAST Multi-Institutional Trials Committee

Invited Discussant: Joseph Galante, MD

Introduction: Early identification of patients with pelvic fractures at risk for severe bleeding requiring intervention is critical. We performed a multi-institutional study to test our hypothesis that pelvic fracture patterns predict the need for a pelvic hemorrhage control intervention.

Methods: This prospective, observational multi-center study enrolled patients with pelvic fracture due to blunt trauma. Inclusion criteria included shock on admission (SBP<90 or HR>120 and base deficit < -5), and the ability to review pelvic imaging. Demographic data, open pelvic fracture, blood transfusion, pelvic hemorrhage control intervention (angioembolization, external fixator, pelvic packing and/or REBOA), and mortality were recorded. Pelvic fracture pattern was classified according to Young-Burgess by either a trauma surgeon or radiologist in a blinded fashion. Predictors of the need for blood transfusion, pelvic hemorrhage control intervention, and mortality were analyzed by univariate and multivariate logistic regression analysis.

Results: A total of 163 patients presenting in shock were enrolled from eleven Level-1 trauma centers. The majority were males (57.7%) with a mean age of 44.1 ± 20.2 and ISS of 28.0 ± 14.2. The most common pelvic fracture pattern (see Table) was Lateral Compression (LC) I, followed by LC II, and Vertical Shear. Of the 12 patients with an Anterior-Posterior Compression (APC) III fracture, 10 (83%) required a pelvic hemorrhage control intervention. APC III (OR 109.4, CI 12.0-994.2) and Vertical Shear (OR 7.0, CI 2.0-24.3) patterns predicted the need for pelvic hemorrhage control intervention on multivariate analysis. Open pelvic fracture (n=12) was also associated with the need for hemorrhage control intervention (OR 7.4, CI 1.5-36.2). While LC I fractures were most common, this fracture pattern was least likely to be associated with the need for pelvic hemorrhage control intervention (23%, p<0.05) on univariate analysis, and a decreased need for blood transfusion on multivariate analysis (OR 0.2, CI 0.05-0.9). Overall in-hospital mortality for patients admitted in shock with pelvic fracture was 30% and did not differ based on pelvic fracture pattern on multivariate analysis.

Pelvic Fracture Pattern for Patients in Shock (n=163 patients)

Lateral Compression I	58 (35.6%)
Lateral Compression II	37 (22.7%)
Vertical Shear	22 (13.5%)
Lateral Compression III	18 (11.0%)
Anterior-Posterior Compression III	12 (7.4%)
Anterior-Posterior Compression II	11 (6.7%)
Anterior-Posterior Compression I	5 (3.0%)

Conclusion: Blunt trauma patients admitted in shock with APC III or Vertical Shear fracture patterns, or patients with open pelvic fracture are at greatest risk of severe bleeding requiring pelvic hemorrhage control intervention.

NOTES

Session: VI: Plenary Session Papers 30-39
Paper 34: 8:50 - 9:10 AM

FAILURE OF NONOPERATIVE MANAGEMENT OF PEDIATRIC BLUNT LIVER AND SPLEEN INJURIES: A MULTICENTER PROSPECTIVE STUDY

Maria E. Linnaus MD, Crystal S. Langlais MPH, Nilda M. Garcia* MD, Adam C. Alder MD, James W. Eubanks III, MD, R. Todd Maxson* MD, Robert W. Letton* MD, Todd A. Ponsky MD, Shawn D. St. Peter MD, Amina Bhatia MD, MS, Daniel J. Ostlie MD, David W. Tuggle* MD, Karla A. Lawson Ph.D., Alexander R. Raines MD, David M. Notrica* MD, Phoenix Childrens Hospital

Invited Discussant: Barbara Gaines, MD

Introduction: Nonoperative management (NOM) is standard of care for blunt liver and spleen injuries (BLSI); only 5% of patients fail NOM in retrospective reports. No prospective studies examine failure of NOM of BLSI in children. The aim of this study was to determine the frequency and clinical characteristics of failure of NOM in pediatric BLSI patients.

Methods: A prospective observational study was conducted on patients 0 to 17 years presenting to any of ten level 1 pediatric trauma centers April 2013 and January 2016 with BLSI on computed tomography. Management of BLSI was based on an evidence-based pediatric guideline. Failure of NOM was defined as needing laparoscopy or laparotomy for BLSI. Descriptive statistics were reported. Children failing NOM were compared to those with successful NOM using Mann-Whitney, Chi-Square, or Fisher's exact as appropriate.

Results: A total of 974 patients met inclusion; 483 (50%) had liver injury, 399 (41%) spleen, and 92 (9%) had both. Most patients were male (n=610; 63%) with a median age of 10.3 years (IQR: 5.9, 14.2). A total of 58 (6%) underwent laparotomy or laparoscopy, but only 28 (3%) underwent surgery for spleen or liver bleeding. Other operations included 24 intestinal surgeries, 7 drain placements, and 3 pancreatectomies. No grade 1 or 2 splenic injuries failed NOM. For grade 3 injuries, 2% of liver and 3% of spleen injuries failed. Of 16 patients who underwent angioembolization, only 2 failed NOM. Patients who failed NOM for BLSI were more likely to have tachycardia ($p<0.001$) and hypotension ($p<0.001$) in the trauma bay, a lower initial hemoglobin (10.5 vs 12.4; $p<0.001$), a higher median injury grade (5 vs. 3; $p<0.001$) and were more likely to have both a liver and spleen injury vs. isolated liver ($p<0.001$) or isolated spleen ($p<0.001$). Patients who failed were more likely to receive blood (23/28 vs 155/945; $p<0.001$) and median time from injury to first blood transfusion was 2 hours for those who failed *vs*. 6 hours for those who did not ($p=0.002$). Overall mortality rate was 21% in those who failed NOM due to bleeding.

Conclusion: NOM fails in 6% of children with BLSI, but only 3% of patients failed due to liver or spleen injury. For children failing NOM due to their BLSI, the mortality was 21%. No children with grade 1 or 2 splenic injuries failed NOM due to bleeding.

NOTES

Session: VI: Plenary Session Papers 30-39
Paper 35: 9:10 - 9:30 AM

OVERALL SPLENECTOMY RATES REMAIN THE SAME DESPITE INCREASING USAGE OF ANGIOGRAPHY IN THE MANAGEMENT OF HIGH GRADE BLUNT SPLENIC INJURY

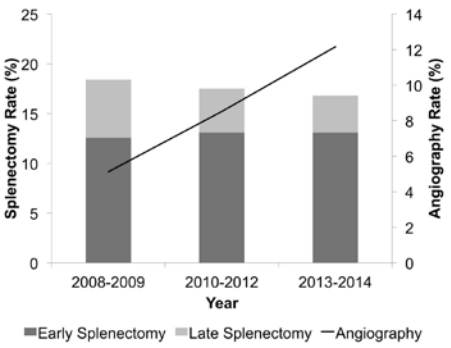
Scott Dolejs MD, Ben L. Zarzaur* MD, MPH, Indiana University School of Medicine

Invited Discussant: Andrew Peitzman, MD

Introduction: Current algorithms for the management of blunt splenic injury (BSI) have shifted to a greater reliance on angiography (ANGIO) in an effort to increase splenic salvage in adults. Several studies indicate an association between increased use of ANGIO and decreased rates of failure of non-operative management (NOM), or delayed splenectomy. However, delayed splenectomy rates are dependent on the types of patients selected for early splenectomy. Associations between ANGIO utilization and improved delayed splenectomy rates could be spurious. Longitudinal comparisons of total splenectomy rates, including both early and delayed splenectomy, could help address this issue. If ANGIO utilization indeed results in saving more spleens, then there should be a reduction in the overall splenectomy rate as ANGIO utilization increases. The purpose of this study was to understand the rate of splenectomy over time and to determine if ANGIO may be impacting the overall splenectomy rate.

Methods: The National Trauma Data Bank was used to identify patients 18 years and older with high grade BSI (Abbreviated Injury Scale ≥3) treated at Level I or II trauma centers between 2008-14, that admitted at least 30 patients with high-grade BSI. Patients who were transferred or died in the emergency department (ED) were excluded. Splenectomy was defined as early if performed within 6 hours of ED admission and delayed if greater than 6 hours. Trends were studied over time. Univariate and multivariable analyses were performed and the Bonferonni correction was used to account for multiple comparisons.

Results: There were 52,705 patients included for analysis. Compared to earlier time frames, there were more early splenectomies and less late splenectomies performed in the most recent period (p-value=0.0001 and 0.0001 respectively). However, the use of ANGIO has rapidly increased from 5.1% in 2008-2009 to 12.2% in 2012-2014 (p-value=0.0001). The overall rate of splenectomy was stable (p-value=0.3416) (FIGURE).



Conclusion: Over the last 7 years, the rate of angiography has been steadily rising while the overall rate of splenectomy has been stable. Incidence of early splenectomy has increased over time with a corresponding decreased rate of late splenectomy. This may indicate that clinicians have become better at identifying patients requiring splenectomy earlier in their injury course. The lack of improved overall splenic salvage, despite increased ANGIO, calls into question the role of ANGIO for high-grade splenic salvage on a national level.

NOTES

Session: VI: Plenary Session Papers 30-39
Paper 36: 9:30 - 9:50 AM

THERE IS NOTHING LITTLE ABOUT THE IMPACT OF BABY ASPIRIN: THE RESULTS OF A PROSPECTIVE AAST MULTI-INSTITUTIONAL TRIAL OF ORAL ANTICOAGULANTS

Leslie M. Kobayashi* MD, Marko Bukur* MD, Richard D. Catalano MD, Eric Ley* MD, Tammy Kopelman* MD, Jacob Quick MD, Omar Rivera MD, Patrick Bosarge* MD, Carlos V. Brown* MD, John Berne* MD, Stephen Kaminski* MD, Raminder Nirula* MD, Martin Schreiber* MD, Forrest D. Moore* MD, Raul Coimbra* MD, AAST Multi-Institutional Trials Committee

Invited Discussant: Charles Wade, PhD

Introduction: The number of anticoagulated trauma patients is increasing. Trauma patients on warfarin have been found to have poor outcomes, particularly following intracranial hemorrhage (ICH). However, the effect of novel oral anticoagulants (NOAs) such as dabigatran, rivaroxaban, and apixaban on trauma outcomes is unknown. We hypothesized that patients on NOAs would have higher rates of ICH, ICH progression, and death compared to patients on traditional anticoagulant and antiplatelet agents.

Methods: This was a prospective observational trial across 16 trauma centers. Inclusion criteria consisted of any trauma patient admitted on aspirin, clopidogrel, warfarin, dabigatran, rivaroxaban, or apixaban. Demographic data, admission vital signs, mechanism of injury, injury severity scores, laboratory values, and interventions were collected. Outcomes included ICH, progression of ICH, and death. Univariate, bivariate and logistic regression analyses were performed.

Results: A total of 1844 patients were enrolled. Mean age was 74.9 years (SD ± 13.8), 46% were female, 77% were Caucasian. At least one co-morbidity was reported in 94% of patients. Blunt trauma accounted for 99% of patients and the median ISS was 9 (IQR 4-14). 50% of patients were on antiplatelet agents, 33% on warfarin, 10% on NOAs, and 7% on combination therapy or subcutaneous agents.

ICH occurred in 30% of patients, of which 40% had a Head AIS $\geq$3. Compared to all other agents, patients on aspirin (90% 81mg, 10% 325mg) had the highest rate of ICH (35%), this correlated with the highest risk of ICH on multivariate analysis (OR 1.7, CI 1.3-2.2, p<0.001). Patients taking NOAs were significantly less likely to have ICH (OR 0.68, CI 0.46-0.99, p=0.049) when compared to all other agents on multivariate analysis. Progression of injury occurred in 17% of patients with ICH. On multivariate analysis risk of progression between agents was similar. When warfarin patients were subdivided by INR, therapeutic patients (INR 1.4-4), were at significantly increased risk of ICH progression (OR 4.7 CI 1.6-13.9, p=0.005) compared to those who were subtherapeutic (INR $\leq$1.4).

Overall study mortality was 7% and was not significantly different between groups on univariate analysis. NOAs as a group were not associated with increased risk of death on multivariate analysis.

Conclusion: Contrary to our hypothesis, patients on aspirin had the highest rate and risk of ICH. Patients on NOAs were not at higher risk for ICH, progression, or death.

NOTES

Session: VI: Plenary Session Papers 30-39
Paper 37: 9:50 - 10:10 AM

Cold storage of platelet concentrates supplemented with resveratrol/cytochrome c preserves platelet function

Susan Evans* MD, Michael Ekaney Ph.D., William Powers MD, Iain McKillop Ph.D.,
Carolinas Medical Center

Invited Discussant: Martin Schreiber, MD

Introduction: The decline of platelet function during storage is attributed to decreased mitochondrial function and/or bacterial contamination. We hypothesized mitochondrial support agents, resveratrol (Res; antioxidant) and cytochrome c (Cyt c; substrate), in combination with hypothermic storage would extend the viability of stored platelets.

Methods: Whole blood derived platelets from 20 donors were pooled into four independent sets in 100% plasma and stored in standard platelet pooling bags for 1-10 days with mild agitation (70rpm). Res (50μM) or Cyt c (100μM) was added immediately prior to storage (22°C or 4°C). Platelet count, platelet coagulation function (thromboelastography), soluble platelet activation markers (CD62P/sP-Selectin), oxygen consumption, catalase activity, lipid peroxidation, glucose, lactate, and pH were assayed in triplicate up to 10 days post-storage.

Results: Independent of storage temperature, platelet function significantly deteriorated with time indicated by increased %ADP (Adenosine diphosphate) and %AA (Arachidonic acid) inhibition, decreased %ADP and %AA aggregation. In the 4°C storage group, treatment with Res or Cyt c markedly decreased %ADP and %AA inhibition up to 10 days post-treatment, an effect not observed at 22°C. In addition, Cyt c increased oxygen consumption at 22°C but neither Cyt c or Res had an effect at 4°C. Analysis of endogenous antioxidant activity demonstrated steady state catalase activity during storage and this activity was further reduced by pretreatment with Res or Cyt c (up to 10 days post-treatment) independent of temperature. Conversely, total platelet count and CD62P was unchanged during storage and was not affected by Res and Cyt c while lipid peroxidation was reduced by Cyt c at 22°C. Glucose concentration decreased during storage, while lactate concentration increased with a decrease in pH. No significant effect on %ADP/AA inhibition/aggregation was observed when platelet concentrates were supplemented with glucose at day 5 of storage. However, an increase in oxygen consumption was observed.

Conclusion: Platelet function is preserved at 4°C versus 22°C for up to 10 days of storage. Treatment with Res or Cyt c modulates platelet function with administration of Res or Cyt c at the beginning of 4°C storage acting to preserve platelet function and mitochondrial activity, thus potentially extending platelet shelf life. Maintenance of physiological levels of glucose, lactate and pH may preservation platelet function for a longer duration at 4°C.

NOTES

Session: VI: Plenary Session Papers 30-39
Paper 38: 10:10 - 10:30 AM

DAILY PROPRANOLOL ADMINISTRATION PREVENTS PERSISTENT INJURY-ASSOCIATED ANEMIA FOLLOWING SEVERE TRAUMA AND CHRONIC STRESS

Ines G. Alamo MD, MPH, Kolenkode B. Kannan Ph.D., Harry Ramos BS, Philip A. Efron MD, FACS, FCCM, Alicia M. Mohr* MD, FACS, FCCM University of Florida – Gainesville

Invited Discussant: Saman Arbabi, MD, MPH

Introduction: Following severe trauma, patients develop a norepinephrine mediated persistent injury-associated anemia that can last for weeks. This results in suppression of bone marrow (BM) erythroid colony growth and ineffective erythropoiesis. In persistent anemia, elevated erythropoietin (EPO) levels are insufficient, regardless, of suppressed hepcidin levels. Using a clinically relevant rodent model of lung contusion (LC), hemorrhagic shock (HS), and chronic stress (CS), we hypothesize that daily propranolol (BB), a non-selective beta-blocker, restores BM function.

Methods: Male Sprague-Dawley rats (n=4-6/group) were subjected to LCHS and LCHS/CS ± BB (10mg/kg). Hemoglobin (Hgb), plasma EPO, hepcidin, BM cellularity and CFU-GEMM, BFU-E and CFU-E colony growth were assessed. Data was presented as mean±SD; *p<0.05 vs. untreated counterpart by t-test.

Results: The addition of CS to LCHS leads to persistent anemia on day 7 and the use of BB improved Hgb levels (13.9±0.4* vs. 10.6±0.8 g/dL). Daily BB use following LCHS/CS improved BM cellularity, CFU-GEMM, BFU-E, and CFU-E colony growth (Table). LCHS/CS+BB significantly reduced plasma EPO levels and increased plasma hepcidin levels on day 7 (Table).

		Seven Days Following LCHS/CS			
	Naïve	**LCHS**	**LCHS+BB**	**LCHS/CS**	**LCHS/CS+BB**
BM cellularity (x10^6)	225±7	191±17	218±26*	164±12	221±31*
CFU-GEMM (colonies/plate)	36±1.3	29±2	35±2*	25±2	30±9*
BFU-E (colonies/plate)	59±0.8	43±4	55±4*	36±3	57±6*
CFU-E (colonies/plate)	64±2.4	49±7	60±2*	38±4	59±4*
Hgb (g/dL)	14.5±0.2	13.1±1.2	13.9±0.9	10.6±0.8	13.9±0.4*
Plasma EPO (pg/ml)	12±4	42±6	29±10*	49± 10	19±2*
Plasma hepcidin (pg/ml)	351±42	69±22	509±38*	56± 24	361±39*

Conclusion: Following severe trauma and chronic stress, daily propranolol use restored BM erythroid growth, plasma EPO and hepcidin levels, and resolved persistent injury-associated anemia. Daily propranolol preserved erythropoiesis by reducing the effects of hypercatecholaminemia on BM function after severe injury.

NOTES

Session: VI: Plenary Session Papers 30-39
Paper 39: 10:30 - 10:50 AM

IS YOUR GRADUATING GENERAL SURGERY RESIDENT QUALIFIED TO TAKE TRAUMA CALL? A 15-YEAR APPRAISAL OF THE CHANGES IN GENERAL SURGERY EDUCATION FOR TRAUMA

Aaron M. Strumwasser MD, Daniel Grabo* MD, Kenji Inaba* MD, Damon Clark MD, Kazuhide Matsushima MD, Lydia Lam* MD, Elizabeth Benjamin* MD, Demetrios Demetriades* MD, LAC+USC Medical Center

Invited Discussant: Mark Malangoni, MD

Background: Trauma training in general surgery residency is undergoing an evolution. The 80-hour workweek, the growth of subspecialty care, interventional radiology and non-operative management has altered resident exposure to operative trauma. We hypothesize that current graduating general surgery residents are exposed to less operative trauma in the current training era. The specific aims of this study are: 1) to perform a comparative analysis of operative caseloads before-and-after the inception of the 80-hour workweek, 2) to note trends in specific operative domains and determine if deficiencies exist, 3) to determine whether subspecialty training (specifically vascular fellowship and integrated vascular surgery residency) has altered general surgery resident operative volume.
Methods: The Accreditation Council for General Medical Education databases on resident trauma operative volume were abstracted for trauma cases by category and by resident training year (junior vs. chief) for the years 1999-2015. Trauma cases were subdivided into the following domains: (1) head and neck, (2) thoracic, (3) abdomen, (4) solid organ and (5) extremity. Resident trauma experience (operative caseload, OC) was compared based on before the inception of the 80-hour (<80h) workweek (1999-2002) and after the 80-hour (>80h) workweek (2003-current). Differences in operative domains and procedures were then compared between groups. An F-test was used to test the groups for normality and an unpaired student's t-test was used to compare means among variables. Data is reported as mean ± standard error for each comparison.**Results:** A trend toward decreased operative trauma for general surgery residents was observed over time (mean OC (<80h vs. >80h) = 36,065.2 ± 1291.8 vs. 39,252 ± 1065.2 cases, p = 0.07) The number of trauma laparotomies increased (range = 4,708-11,234 cases) while there was a sharp decrease in vascular trauma (range = 4,926-799 cases), with neck explorations (range = 1,086-1,944 cases) and thoracotomies (range = 2,210-2,707 cases) relatively stable **(Figure 1)**. Moreover, as open vascular OC by general surgery trainees decreased (mean OC (<80h vs. >80h) = 4599.3 ± 135.3 vs. 2754.6 ± 443.0 cases, p < 0.01), there was a relative increase in the open vascular OC of vascular fellows and integrated vascular surgery residents (mean OC (<80h vs. >80h) = 844.8 ± 44.2 vs. 1464.5 ± 88.4 cases, p < 0.01). When individual graduating resident deficiencies were analyzed by time period (<80h vs. >80h), decreased operative volumes were prevalent across multiple domains including decreased operative caseloads in thoracic, abdominal, solid organ, and extremity vascular trauma (<80h vs. >80h, p < 0.01 for each) **(Table 1)**.

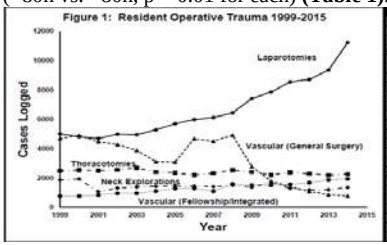


Table 1: Graduating General Surgery Resident Trauma Caseload

Operative Domain	Before 80h Workweek	80h Workweek	P-Value
Head and Neck			
Carotid/Jugular	0.7 ± 0.3	0.5 ± 0.1	0.73
Thoracic			
Thoracotomy	12.7 ± 0.2	11.3 ± 0.3	0.01
Thoracoscopy	1.3 ± 0.1	1.4 ± 0.1	0.002
Cardiac	2.0 ± 0.1	1.4 ± 0.1	0.002
Thoracic - Vascular	1.9 ± 0.06	0.7 ± 0.1	< 0.001
Abdomen			
Laparotomy	24.2 ± 0.1	35.1 ± 1.7	0.004
Esophagus	0.7 ± 0.02	0.5 ± 0.01	0.003
Gastric	4.1 ± 0.1	2.5 ± 0.3	0.002
Duodenal	0.5 ± 0.02	0.5 ± 0.02	0.9
Small Bowel	16.0 ± 0.4	10.7 ± 1.1	0.006
Colon	10.3 ± 0.4	8.8 ± 0.5	0.04
Abdominal - Vascular	1.4 ± 0.6	1.2 ± 0.3	0.8
Solid Organs			
Liver	10.6 ± 0.3	8.4 ± 0.4	0.001
Spleen	15.7 ± 0.2	13.5 ± 0.6	0.005
Kidney	2.3 ± 0.04	1.0 ± 0.3	0.01
Pancreas	2.2 ± 0.04	1.8 ± 0.1	0.02
Extremity			
Fasciotomy	6.5 ± 0.3	5.1 ± 0.6	0.07
Extremity - Vascular	19.1 ± 1.5	6.2 ± 1.7	0.0003

Conclusions: A significant paradigm shift for trauma training has occurred. Based on the data, an alarming rate of graduating general surgery residents are completing training with substantially less experience in defined trauma categories. A call for advanced simulation training in general surgery residency is needed to augment operative experience for trainees. Due to a decline in trauma operative volume for the average resident, advanced fellowship training should be encouraged specifically for those residents interested in a career in trauma and acute care surgery.

NOTES

SCHOLARSHIP PRESENTATIONS

BY 2015-2016 AAST RESEARCH SCHOLARSHIP RECIPIENTS

THURSDAY, SEPTEMBER 15, 2016, 11:00 AM – 11:30 AM

GRAND BALLROOM

PRESIDING: GRACE ROZYCKI, M.D., M.B.A.,

AAST PRESIDENT

11:00 AM – 11:05 AM
Carrie Sims, M.D.
University of Pennsylvania
Philadelphia, PA
The ACS, AAST and NIGMS Jointly Sponsored Mentored Clinical Scientist Development Award (K08/K23) (2011-2016)
Project Title: The Impact of Vasopressin on Mitochondrial Dysfunction in Hemorrhagic Shock

11:07 AM – 11:12 AM
Matthew Delano, M.D.
University of Michigan
Ann Arbor, MI
AAST Research & Education Foundation Award (2015-2016)
Project Title: Impact of Gm-CSF on Innate Immunity and Mortality Secondary Infection Following Sepsis

11:14 AM – 11:19 AM
Benjamin Levi, M.D.
University of Michigan
Ann Arbor, MI
AAST Research & Education Foundation Award (2015-2016)
Project Title: Identifying therapeutics to target progenitor cells that cause trauma-induced heterotopic ossification

11:21 AM – 11:26 AM
Matthew D. Neal, M.D.
University of Pittsburgh
Pittsburgh, PA
AAST Research & Education Foundation Award (2015-2016)
Project Title: Platelet derived HMGB1 regulates thrombosis and organ injury following trauma

42ND 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

THURSDAY, SEPTEMBER 15, 2016, 11:30 AM – 12:30 PM

AAST 42ND WILLIAM T. FITTS, JR. LECTURE

LOCATION: GRAND BALLROOM

"When Peace Breaks Out"

M. Margaret Kundson, M.D.
University of California San Francisco
San Francisco, California

****

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 Ms. 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

OPTIONAL SESSION:

ANZAST / ATS SESSION

THURSDAY, SEPTEMBER 13, 2016, 1:00 PM – 4:00 PM

KONA BALLROOM 4-5

MODERATOR: ZSOLT BALOGH, M.D., Ph.D.

SESSION IX:

ACUTE CARE SURGERY

PAPERS #40 - #48

FRIDAY, SEPTEMBER 16, 2015, 7:30 AM – 10:00 AM

GRAND BALLROOM

MODERATOR: KIMBERLY DAVIS, M.D., M.B.A.

RECORDER: JOSEPH MINEI, M.D., M.B.A.

Session: IX: Acute Care Surgery
Paper 40: 7:30 - 7:50 AM

EXPANDING THE SCOPE OF QUALITY MEASUREMENT IN SURGERY TO INCLUDE NON-OPERATIVE CARE: RESULTS FROM THE ACS NSQIP EMERGENCY GENERAL SURGERY PILOT

Michael W. Wandling MD, Clifford Y. Ko MD, MS, MSHS, Paul E. Bankey, MD, PhD, Chris Cribari* MD, H. G. Cryer* III, MD, Ph.D., Jose J. Diaz, MD, Therese M. Duane, MD, MBA, S. M. Hameed MD,MPH, Matthew M. Hutter MD,MPH, Michael H. Metzler* III, MD, Justin L. Regner MD, Patrick M. Reilly* MD, H D. Reines MD, Jason L. Sperry* MD, MPH, Kristan L. Staudenmayer* MD, Garth H. Utter* MD, MSc, Marie L. Crandall* MD, MPH, Avery B. Nathens* MD, Ph.D., American College Of Surgeons

Invited Discussant: John Fildes, MD

Introduction: Patients managed non-operatively are typically excluded from risk-adjusted benchmarking programs, including ACS NSQIP. As such, optimal performance evaluation is not possible for specialties like emergency general surgery (EGS) where non-operative management is common. We developed a multi-institutional EGS clinical data registry within ACS NSQIP that includes patients managed non-operatively to understand variability in non-operative care across centers and gaps in performance evaluation that result when only operative cases are considered.

Methods: Using ACS NSQIP infrastructure and methodology, surgical consultations for small bowel obstruction (SBO), cholecystitis, and appendicitis were sampled at 13 hospitals. Standard NSQIP variables and 16 EGS-specific variables were abstracted with 30-day follow-up. To determine the influence of complications in non-operative patients, rates of serious morbidity, mortality, and readmission were identified and hospitals were ranked based on complication rates with and then without including non-operative cases.

Results: 2,076 patients were included, 29.3% with SBO, 24.2% with cholecystitis, and 46.5% with appendicitis. Overall, 27.6% of patients were managed non-operatively (SBO=69.8%, cholecystitis=16.7%, appendicitis=6.6%). Rates of non-operative management across hospitals ranged from 53.3%-77.5% for SBO, 0.0%-35.3% for cholecystitis, and 1.8%-10.0% for appendicitis. While patients treated non-operatively accounted for only 27.6% of included patients, they accounted for 41.6% of readmissions and 35.6% of all serious morbidities. Including non-operative cases in performance evaluation resulted in a change in performance rank for 9 hospitals, with 5 changing performance quartiles.

Conclusion: These data reveal marked variability in non-operative management rates across centers and significant 30-day complication rates for non-operative management in EGS. This study demonstrates the gap in performance evaluation that exists when non-operative patients are excluded from surgical quality assessment. Including these patients in clinical registries, pay-for-performance initiatives, and public reporting programs is important for performance evaluation and improving the care of all surgical patients, not just those who have an operation.

NOTES

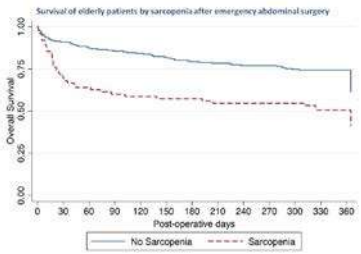
Session: IX: Acute Care Surgery
Paper 41: 7:50 - 8:10 AM

SARCOPENIA INCREASES LONG-TERM MORTALITY IN ELDERLY PATIENTS UNDERGOING EMERGENCY GENERAL SURGERY

Arturo J. Rios-Diaz MD, Jennifer W. Uyeda MD, Zara Cooper* MD, MSc, FACS, Ali Salim* MD, FACS, Aaron Sodickson MD,Ph.D., Erika L. Rangel MD, MS, FACS
Brigham and Womens Hospital

Invited Discussant: Kevin Schuster, MD, MPH

Background: Sarcopenia, or the loss of lean muscle mass, is a key component of frailty. Frailty is associated with poor postoperative outcomes, but the ability to quantify it is limited in the emergency setting. Sarcopenia is an objective measure that can be easily calculated from preoperative imaging. It has been associated with higher in-hospital mortality following emergency general surgery in elderly patients, but little is known about its effect on long-term outcomes in this group. We sought to determine the impact of sarcopenia on long-term mortality after emergency general surgery in elderly patients.
Methods: We identified patients >70 years who underwent emergent abdominal surgery from 2006-2011. Patients without preoperative computed tomography (CT) or recorded height were excluded. The average bilateral psoas muscle cross-sectional area (PSA) at the L3 level, normalized for height, was calculated using preoperative CT images. Sarcopenia was defined as normalized PSA in the lower sex-specific quartile. Primary outcome was mortality at 1 year. Mortality at 30 days (d), 90d, 180d were also examined. Cox proportional hazards regression was used to determine the independent association of sarcopenia with mortality at each time point. Models were controlled for age, gender, race, Charlson comorbidity index, American Society of Anesthesiology (ASA) score, length-of-stay (LOS), operative severity, type of procedure, procedure urgency, and malignancy.
Results: 390 patients met inclusion criteria. Of those, 297 (76.2%) had preoperative imaging and height. The median age was 79 years (IQR, 74-83), with an in-hospital mortality of 14.9%. Sarcopenic patients did not differ in terms of age, gender, race, comorbidities, malignancy, ASA, procedure urgency or type, operative severity, or discharge to facility. Sarcopenic patients had longer LOS (14 vs. 11 d; p=0.012), were more likely to require ICU care (67% vs. 50%, p=0.012), and had higher in-hospital mortality (27% vs. 9%; p<0.01). Patients with sarcopenia had higher hazard ratios of mortality at 30d (HR:1.59; 95% CI:1.12-2.29; p=0.01), 90d (HR:1.70; CI:1.19-2.44; p<0.01), 180d (HR:1.58; CI:1.10-2.27; p=0.01) and 1yr (HR:1.64; CI:1.14-2.36; p<0.01).



Conclusion: Sarcopenia is an independent predictor of mortality in elderly patients undergoing emergent abdominal surgery, and this risk continues long after hospital discharge. Sarcopenia determined by PSA is a relatively simple and objective measure of frailty that can be calculated before surgery to identify particularly vulnerable patients for consideration of less invasive approaches and for improved perioperative counseling.

NOTES

Session: IX: Acute Care Surgery
Paper 42: 8:10 - 8:30 AM

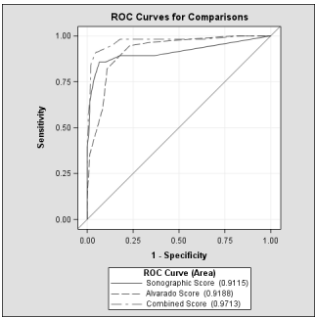
HIGH SENSITIVITY AND SPECIFICITY FOR ULTRASOUND IN THE DIAGNOSIS OF APPENDICITIS

Swathi B. Reddy* MD, Michael Kelleher MD, Jamal Bokhari MD, Kimberly A. Davis* MBA,MD, Kevin M. Schuster* MD,MPH, Yale School Of Medicine

Invited Discussant: Marie Crandall, MD, MPH

Introduction: CT scanning reduces the negative appendectomy rate however it exposes the patient to ionizing radiation. Ultrasound (US) is less commonly used due to a rate of non-visualization of up to 70%. The purpose of this study was to formulate a scoring system to predict appendicitis using US as the only imaging modality using specific US criteria.

Methods: We conducted a retrospective review of all patients (>15 yo) who presented through the emergency department with suspected appendicitis and underwent initial US. An ultrasound score was developed using odds ratios (table) for appendicitis given appendiceal diameter, compressibility, hyperemia, and secondary signs of inflammation including free fluid and focal or diffuse tenderness. If the appendix was not visualized, only secondary signs were documented. The ultrasound score was then combined with the Alvarado score. Final diagnosis of appendicitis was assigned by reviewing pathology reports.



Results: Three hundred patients who underwent US as initial imaging were identified. Thirty-two patients with evident non-appendiceal pathology on US were excluded. In 114 (38%) the appendix was not visualized and partially visualized in 36 (12%). 61 (20.4%) had an appendectomy with 1 (1.6%) negative. Six non-visualized appendicies underwent appendectomy, with no negative cases. Sensitivity and specificity were 86% and 97% at a US score of 1.5. This improved to 98% and 97% respectively for a combined score of 6.5. Area under receiver operating characteristic (ROC) curves for our new score were similar to the ROC curve for the Alvarado score (91.9 and 91.1, P = 0.8). The combined US and Alvarado score yielded an AUC of 97.1, significantly better than either score alone (P =0.017 and P < 0.001 respectively).

Conclusion: Our scoring system based entirely on US findings was highly sensitive and specific for appendicitis, and it significantly improved when combined with the Alvarado Score. After prospective evaluation the combined US-Alvarado score might replace the need for CT imaging in a majority of patients.

US characteristic	OR	Points
Hyperemia	28.74	1
Non-compressibility	25.50	2
Focal tenderness	176.33	2
Diffuse tenderness	7.67	1
Large free fluid	23.23	1
Small free fluid	2.79	0.5
Size 6-10mm	37.19	1
Size >10mm	680.00	2

NOTES

Session: IX: Acute Care Surgery
Paper 43: 8:30 - 8:50 AM

Pneumatosis Intestinalis Predictive Evaluation Study (PIPES): A Multicenter Epidemiologic Study of the American Association for the Surgery of Trauma.

Paula Ferrada* MD, Rachael Callcut* MD, Graciela Bauza MD, Karen R. O'Bosky MD, Xian Luo-Owen, Ph.D., Nicky J. Mansfield MD, Kenji Inaba* MD, Jason Pasley DO, Nikolay Bugaev MD, Bruno Pereira MD, Forrest Moore* MD, Jinfeng Han RN, Joseph DuBose* MD, AAST Multi-Institutional Trials Committee

Invited Discussant: Fred Luchette, MD, MSc

Background:
Pneumatosis intestinalis (PI) is associated with numerous adult conditions, ranging from benign to life-threatening. Our group has previously published a retrospective review defining variables predictive of transmural bowel ischemia in the setting of PI. We hypothesize this prospective study will confirm the findings of the retrospective review, enhancing legitimacy to the predictive factors for pathological PI previously highlighted.

Methods:
Demographics, past medical history, clinical presentation and outcomes were collected. The primary outcome was the presence of pathologic PI defined as confirmed transmural ischemia at surgery or in the autopsy report if available when mortality was the final outcome. Forward logistic regression was utilized to identify independent predictors for pathologic PI. Statistical significance was defined as a p-value of ≤ 0.05

Results:
During the 3-year study period, 127 patients with PI were identified. Of these 79 had benign disease and 49 pathological PI defined by the presence of transmural ischemia during surgical exploration or autopsy. Laboratory values such as elevated INR, decreased hemoglobin, and a lactate value of 2.0 or greater, were predictive of pathological PI as well as clinical factors including the presence of an adynamic ileus, peritoneal signs on physical exam, the absence of bowel sounds, sepsis, and hypotension. The Location was also a significant factor, as patients with small bowel PI had a higher incidence of transmural ischemia than PI at colonic locations. As expected patients with pathological PI had an increased hospital length of stay (LOS), ICU LOS, and higher mortality than those patients with benign disease. On multiple logistic regression, a lactate value of 2.0 or greater [OR 5.1, 1.3-19.5, p=0.018], elevated INR [OR 3.2, 1.1-9.6, p=0.031], peritonitis [15.0, 2.9-78, p=0.001], and decreased hemoglobin [0.70, 0.50-0.97, 0.031] remained significant predictors of transmural ischemia [AUC 0.90, 0.83-0.97]. A lactate value of 2.0 or greater and peritonitis are common factors between the retrospective review and this prospective study.

Conclusion:
This is the first multicentric prospective study identifying independent predictors of pathological PI. We recommend surgical exploration to be strongly considered for those PI patients presenting also with a lactate>2 or/and peritonitis

NOTES

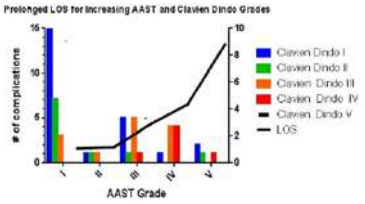
Session: IX: Acute Care Surgery
Paper 44: 8:50 - 9:10 AM

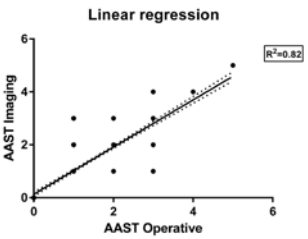
INCREASED ANATOMIC INJURY PREDICTS OUTCOMES: VALIDATION OF AAST EMERGENCY GENERAL SURGERY GRADE IN APPENDICITIS

Matthew Hernandez MD, Johnathon Aho MD, Asad Choudhry MBBS, David Morris* MD, Martin Zielinski* MD, Mayo Clinic – Rochester

Invited Discussant: Nicole Stassen, MD

Introduction: Determination and reporting of disease severity in emergency general surgery (EGS) lacks standardization. Recently, the American Association for the Surgery of Trauma (AAST) proposed an anatomic severity grading system for EGS diseases. We aim to externally validate this grading system for patients with appendicitis, and if it may be further applied to pre-operative cross sectional imaging to correlate disease severity with AAST severity grade assignment at operation.
Methods: Patients 18 years or older who underwent appendectomy for acute appendicitis between January 2013 - January 2015 were identified. Baseline demographics, preoperative Alvarado scores, procedure types were recorded, and AAST grades were assigned based on intraoperative findings. Cross sectional imaging was assigned AAST grade based on preoperative findings from radiologic reports and independent review. Outcomes including length of stay, 30 day mortality, and complications based on Clavien-Dindo categories were collected. Summary statistical univariate and nominal logistic and standard least squares analyses were performed to compare AAST grade with procedure type, complications, and cross sectional imaging.
Results: A total of 299 patients with a mean (±SD) age of 37.8 years (±15.3) were included (52% male) and all patients had preoperative cross sectional imaging. All patients underwent appendectomy, and 94% were completed laparoscopically. Overall 30 day mortality rate was 0%, complication rate was 17%. Calculated operative AAST grade strongly correlated with calculated AAST grade assessed on cross sectional imaging (R 2= 0.82). Mean (±SD) AAST operative grades were significantly associated with the following key measures associated with disease severity ($p<0.0001$) procedure type: laparoscopic 1.3 (±0.05), open 3.6 (±0.4), conversion to open 3.0 (±0.3). Increased mean (±SD) AAST grades was recorded in patients with complications 2.18 (±0.12) compared to those without 1.34 (±0.06), $p<0.0001$.
Conclusions: The AAST EGS grading system was valid in our population and increased AAST grade is significantly associated with open procedures, complications, and length of stay. AAST EGS grade determined by preoperative imaging was strongly correlated to operative AAST grade. Further study aimed at validating AAST anatomic grading in appendicitis prospectively is required.





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Session: IX: Acute Care Surgery
Paper 45: 9:10 - 9:30 AM

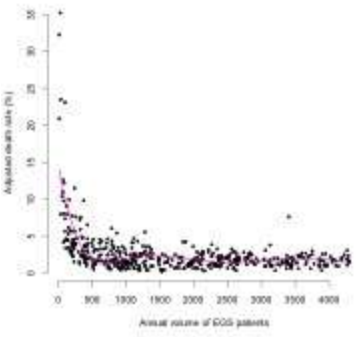
HOSPITALS WITH HIGHER VOLUMES OF EMERGENCY GENERAL SURGERY PATIENTS ACHIEVE LOWER MORTALITY RATES: A CASE FOR ESTABLISHING DESIGNATED CENTERS FOR EMERGENCY GENERAL SURGERY

Gerald Ogola Ph.D., Adil Haider* MD,MPH, Shahid Shafi* MD,MPH, Baylor Scott & White Health System

Invited Discussant: David Hoyt, MD

Introduction: Relationship between higher surgical volume and lower mortality is well established. However, it is not known if this relationship exists in the management of Emergency General Surgery (EGS) diseases. Our hypothesis was that EGS patients treated at hospitals with higher EGS volume experienced lower mortality rates compared to those treated at low volume hospitals.

Methods: This a retrospective analysis of National Inpatient Sample (NIS) data for 2010. NIS is a representative sample of inpatients, maintained by the Agency for Healthcare Quality and Research (AHRQ). Patients with EGS conditions were identified using AAST definition with relevant ICD9 codes (2,640,725 patients from 943 hospitals). For each center, mortality rates were calculated using logistic regression, adjusted for age, sex, race, ethnicity, insurance, and comorbidities. For each hospital, the adjusted mortality rate (percent mortality, 95% Confidence Intervals, CI) was plotted against their EGS volume. Due to nonlinear r elationship between mortality rate and volume, a cubic spline regression model with 4-knots was fitted to estimate volume associated with threshold for low mortality. Hospitals were also classified by quintiles of annual volume of patients and adjusted mortality rates, and compared with each other.



Results: Volume of EGS patients treated at the hospitals was inversely associated with their mortality rates (Figure). Mortality rate in hospitals in the highest quintile of volume (9466±3292 patients) was 1.5% (95% CI 1.4% to 1.6%) compared to those in the lowest quintile of volume (415±240 patients) at 4.6% (95% CI 3.7% to 5.5%) with $p < 0.01$. However, mortality rate appeared to stabilize at an annual volume of 750 patients. Mortality rate in hospitals that treated fewer than 750 patients was 4.9% (95% CI 4.0 to 5.9), compared to those that treated 750 or more patients 1.7% (95% CI 1.6 to 1.8) with $p < 0.01$.

Conclusion: EGS patients treated at hospitals with higher volume of EGS patients experienced lower mortality rates, with a possible threshold of 750 patients per year. The findings suggest that establishing designated EGS centers, similar to designated trauma centers, may improve outcomes of EGS patients.

NOTES

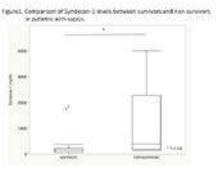
Session: IX: Acute Care Surgery
Paper 46: 9:30 - 9:50 AM

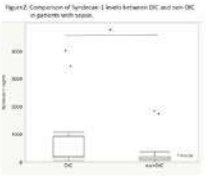
Circulating syndecan-1 detect the development of disseminated intravascular coagulation in patients with sepsis

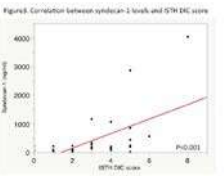
Mitsunori Ikeda MD, Hisatake Matsumoto MD, Hiroshi Ogura Ph.D., Tomoya Hirose MD, Kentaro Shimizu Ph.D., Kouji Yamamoto Ph.D., Takeshi Shimazu* Ph.D., Osaka University Graduate School of Medicine

Invited Discussant: Sonlee West, MD

Introduction: Sepsis is a major cause of death in intensive care unit. One of the pathophysiological process in sepsis is endothelial dysfunction, and it induces disseminated intravascular coagulation (DIC). Syndecan-1 is a major structure of endothelial barrier and plays a key role as a target for inflammatory mediators within the acute phase of the endothelial dysfunction. The purpose of this study is to investigate the clinical significance of syndecan-1 and to explore the association between syndecan-1 levels and DIC in patients with sepsis.
Methods: We perform a prospective observational study of patients with severe sepsis and septic shock greater than 18 years from February 2014 to July 2015. Blood samples were collected from patients on days 1, 2, 4, 6, 8, 11 and 15 after the diagnosis of sepsis and from healthy volunteers. The concentrations of syndecan-1, endothelial markers (VCAM-1, PAI-1), inflammatory markers (IL-1β,IL-6 , HMGB-1,Histone H3) were measured using an enzyme-linked immunosorbent assay kit. The 28-day survival data and ISTH overt DIC diagnostic criteria algorithm for assessing DIC over all time points were collected.
Results: During the study, 39 sepsis patients and 15 healthy volunteers were included. The syndecan-1 levels were significantly increased in patients with sepsis compared with healthy controls (p<0.001). Of the sepsis patients, non-survivors had significantly higher syndecan-1 levels than those of survivors (p <0.01). The syndecan-1 levels on day 1, 2, 4 were significantly higher in patients with DIC than those without. Cox regression analysis showed that the maximal levels of syndecan-1 on day 1, 2, 4 were significantly correlated with the 28-day mortality (hazard ratio 1.001, p<0.001) and the development of DIC (hazard ratio 1.0005, p =0.012). Significant correlations were also found between the syndecan-1 and DIC score, IL-1β, IL-6 and lactate over three time points (day 1, 2, 4).
Conclusion: We demonstrated for the first time that the syndecan-1 levels in acute phase had significant correlation with DIC in sepsis, suggesting it would be an important marker of the development of DIC.







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Session: IX: Acute Care Surgery
Paper 47: 9:50 - 10:10 AM

International Rotations: A Valuable Resource to Supplement Operative Experience for Acute Care Surgery, Trauma and Surgical Critical Care Fellows.

Paula Ferrada* MD, Rao R. Ivatury* MD, David A. Spain* MD, Kimberly A. Davis* MBA, MD, Michel Aboutanos* MD,MPH, John J. Fildes* MD, Thomas Scalea* MD, Multi Organization Study: Critical Care Program Directors And Acute Care Surgery Program Directors

Invited Discussant: Martin Croce, MD

Introduction: Acute Care Surgery (ACS), Trauma and Surgical Critical Care (SCC) fellowships graduate fellows deemed qualified to perform complex cases immediately upon graduation. We hypothesize international fellow rotations (IFR) can be a resource to supplement operative case exposure
Methods: A survey was sent to all program directors of ACS and SCC fellowships via email. Data was captured and analyzed using the Research Electronic Data Capture (REDCap) tool. The survey included RRC approved SCC fellowships and a variety of trauma and ACS fellowships, some verified by the AAST. Available case logs from 3 IFR of a Trauma Society were reviewed to verify the operative experience.
Results: The survey was sent to 113 program directors (PDs) with a response rate of 42%. The types of fellowship included were: 1 year critical care with some trauma exposure (10.6%), 1 year critical care with significant trauma exposure (25.5%), 2 years including critical care and trauma exposure (4.3%), 2 year critical care, trauma and emergency surgery fellowship non-AAST (23.4%), and 2 year AAST ACS certified (36.2%). The majority of programs trained 2 fellows or less (68%). Most fellows performed < 150 operative cases (59.5%). The majority of PDs thought the operative exposure could either be improved or was not enough to ensure expertise in trauma and emergent general surgery (can be improved 42.6%, not enough 29.8%). Most PDs thought an international experience could supplement the breath of cases, provide research opportunities, and improve understanding of trauma systems worldwide (70%). Barriers to these rotations include lack of contacts in other countries, safety, and economic concerns. A total of 10 sites offered international rotations as part of the curriculum, most of them having the time away built in as an elective in the program (70%). Most programs have funding for these rotations but in 20% of these programs the fellows have to cover their own expense. Most fellowship directors agreed the fellows' experience abroad was excellent and consistent over time (70%) and most fellowship directors perceived that for their fellows, these experiences were worth the cost, effort and the time away from family (80.0%). Most fellowships would be willing to provide reciprocity to the international program where their fellows are sent to train (90%).Operative case logs from IFRs averaged 39 cases per week with the following distribution: Elective(n= 89) cases, Emergency general surgery (n= 36), Trauma including abdominal and thoracic (n=33), major burn wound debridement ± skin grafting (n=114).
Conclusions: The majority of PDs for ACS, trauma, and SCC programs perceive a need for increased quality and quantity of operative cases. The majority also identify IFR as a valuable tool to supplement fellows' education. Consistent funding sources remain a barrier for offering this educational opportunity.

NOTES

Session: IX: Acute Care Surgery
Paper 48: 10:10 - 10:30 AM

IMPAIRED ADIPONECTIN TRANSPORT CAPACITY IN LEUKOCYTES FROM CRITICALLY ILL PATIENTS

Yutaka Umemura MD, Kentaro Shimizu MD, Hiroshi Ogura* MD, Jinkoo Kang MD, Norikazu Maeda MD, Tohru Funahashi MD, Iichiro Shimomura MD, Koh Taichin MD, Takeshi Shimazu* MD, Osaka University Graduate School of Medicine

Invited Discussant: Jon Simmons, MD

Introduction: Deficiency of adiponectin, adipose derived cytokine with strong anti-inflammatory property, has been reported to affect metabolic syndrome, such as atherosclerosis and type 2 diabetes mellitus. Recent study suggests that adiponectin is localized on the surface of leukocyte adherent to endothelial cells in injured tissue and can promote tissue repair. However, exact role and kinetics of adiponectin in the acute phase of systemic inflammatory response syndrome (SIRS) have not been fully understood. We aimed for the first time to evaluate whether the transport capacity of adiponectin was impaired in critically ill patients.

Methods: This study prospectively included 16 healthy volunteers and 31 SIRS patients, including 16 patients with sepsis and 8 patients with severe trauma (Injury Severity Score; ISS > 16), admitted to a tertiary referral hospital in Japan. The levels of adiponectin combined with monocytes and lymphocytes and the levels of three kinds of adiponectin receptors (receptor 1, receptor 2, cadherin) on the surface of these leukocytes were measured using the flow-cytometry. Data is shown as mean ±standard deviation. We also evaluated the correlation between the transport capacity of adiponectin and severity of illness.

Results: In 31 SIRS patients, the level of adiponectin combined with leukocytes was significantly lower compared to that in healthy volunteers (119.3 ±48.6 vs. 258.1 ±51.1, $p<0.001$ in monocytes and 113.5±41.0 vs. 214.4±38.8, $p<0.001$ in lymphocytes, mean fluorescence/cell). Also, the levels of receptor 2 and cadherin on the surface of monocytes were significantly lower in SIRS patients (707.7±233.6 vs. 1088.6±354.1, $p<0.001$ and 181.2±86.8 vs. 286.5±101.4, $p = 0.006$ respectively). In the subgroup with severe trauma, similar trends were observed, and in addition, the levels of adiponectin combined with monocytes negatively correlated to the ISS (correlation coefficient: 0.65).

Conclusion: We demonstrated that the transport capacity of adiponectin was impaired in SIRS patients. The deficient adiponectin transport to injured tissue may delay the recovery from critical illness.

NOTES

FRIDAY, SEPTEMBER 16, 2016, 10:30 AM - 11:45 AM

SESSION X: PANEL:
IOM REPORT ON MILITARY CIVILIAN COLLABORATION
LOCATION: GRAND BALLROOM

MODERATOR: TODD RASMUSSEN M.D.
MODERATOR: DAVID HOYT, M.D.

Thomas Scalea, M.D.

Ronald Stewart, M.D.

John Holcomb, M.D.

M. Margaret Kundson, M.D.

Donald Jenkins, M.D.

Matthew Martin., M.D.

SESSION XIA:

PAPERS #49 - #59

FRIDAY, SEPTEMBER 16, 2016, 1:00 PM – 4:40 PM

GRAND BALLROOM

MODERATOR: ROSEMARY KOZAR, M.D., Ph.D.

RECORDER: ALI SALIM, M.D.

Session: XIA: Papers 49-59
Paper 49: 1:00 - 1:20 PM

FACING THE FACTS ON PROPHYLACTIC ANTIBIOTICS AND FACIAL FRACTURES: ONE DAY OR LESS

Brenda M. Zosa MD, Charles W. Elliott BS, Freedom Johnson MD, Jeffrey A. Claridge* MD, MS MetroHealth Medical Center

Invited Discussant: Heather Evans, MD

Introduction: There is no clear evidence for the use of prophylactic antibiotics in preventing infections in the critically injured patient with facial fractures (fx) and practice is highly variable. We compared outcomes in critically injured patients with facial fx who received a short course of antibiotics upon admission to those who received an extended course.

Methods: All adult patients admitted (2010–2015) to a level 1 trauma center intensive care unit with at least 1 facial bone fracture were included. Patients with concomitant head and neck injuries were included. However, patients with significant injuries in any other body region were excluded. Our primary analysis compared infectious complications of the head or neck (H/N infx) between patients given an initial short course of antibiotics, defined as less than 24 hours of antibiotics upon admission, to those given an extended course, defined as greater than 24 hours of antibiotics duration. Multivariate logistic regression (MLR) and analysis of propensity score matched pairs was performed.

Results: There were 403 patients included in this study. 345 patients (85.6%) had blunt injuries. 293 patients (72.7%) had facial fx managed non-operatively. Overall H/N infx rate was 11.2%. Upon admission, 280 patients received a short course of antibiotics and 123 patients received an extended course. Mean ISS (14) was similar between the 2 groups. Patients who received an extended course of antibiotics were younger (47.8 vs 53.8 years, p= 0.011), more likely to be male (79.7% vs 68.6%, p= 0.023), have a penetrating injury (33.3% vs 6.1%, p< 0.001), have fx in multiple facial thirds (51.2% vs 25.0%, p< 0.001), and less likely to have traumatic brain injury (72.5% vs 50.4%, p< 0.001). Patients who received an extended course of antibiotics had higher rates of H/N infx (20.3% vs 7.1%, p< 0.001) and any infection overall (30.9% vs 15.7%, p = 0.001) when compared to those who received a short course. Factors associated with development of H/N infx in the overall population are illustrated in Table 1. MLR identified younger age (OR=0.977, 0.958-0.997, p=0.021), multiple facial third fxs (OR=4.918, 2.378-10.169, p< 0.001), and penetrating mechanism (OR=3.056, 1.468-6.361, p=0.003) as independent predictors of H/N infx. Subgroup analysis of blunt, penetrating, operatively managed, and patients with multiple facial third fx revealed similar results. Additional propensity-score matched analysis of 80 pairs of patients found no differences in H/N infx between short and extended antibiotic courses (11.3% vs 15.0%, p= 0.640).

Conclusions: Extended courses of prophylactic antibiotics did not reduce infections, even in the highest risk patients. Based on our results, we do not recommend more than 24 hours of antibiotics upon admission for facial fx.

Table 1. Factors Associated with H/N Infx

	No H/N Infx (n=358)	H/N Infx (n= 45)	*p* value
Mean Age (years)	54	39	<0.001
Open Fx	15%	47%	<0.001
Upper Face Fx	21%	47%	0.001
Mandible Fx	17%	60%	<0.001
Penetrating Injury	11%	40%	<0.001
Vascular Injury	3%	16%	0.002
Fxs in >1 Facial Third	28%	73%	<0.001
Hypertension	34%	13%	0.004
Extended abx course	27%	56%	<0.001

NOTES

Session: XIA: Papers 49-59
Paper 50: 1:20 - 1:40 PM

A predictor of mortality right under the nose: Measuring sarcopenia in elderly trauma patients using head CT

James D. Wallace MD, Richard Y. Calvo Ph.D., Paul R. Lewis DO, Jason B. Brill MD, Michael J. Sise* MD, C. Beth Sise RN, Steven R. Shackford* MD, Vishal Bansal* MD, Scripps Mercy Hospital Trauma Service

Invited Discussant: Zara Cooper, MD, MSc

Introduction: Sarcopenia, the degenerative loss of skeletal muscle mass, can be measured by computed tomography (CT) scan. Decreased psoas muscle cross sectional area (P-Area) on abdominal CT scan is associated with increased risk for mortality in elderly trauma patients. Fall is the most common mechanism of injury in the elderly, consequently CT imaging of the head is obtained more often than CT imaging of the abdomen. Masseter muscle cross sectional area (M-Area) can be conveniently measured on routine head CT imaging. We compared the utility and feasibility P-Area versus M-Area as markers of sarcopenia and increased risk of mortality in elderly trauma patients.

Methods: All blunt-injured patients aged ≥65 years admitted to our urban level I trauma center during the 2010 calendar year were included. Post-discharge mortality was identified by matching records to county and state death indices as well as the Social Security Death Index. Admission head CT scans were retrospectively reviewed, using standard hospital imaging software, to measure bilateral M-Area two centimeters below the zygomatic arch. Bilateral P-Area was similarly measured using abdominal CT at the level of the fourth vertebral body. Average M-Area and P-Area values were calculated for each patient. Cox proportional hazards models were constructed to evaluate the relationship of M-Area and P-Area with two-year mortality, adjusting for relevant covariates. Model predictive performance was calculated using concordance statistics.

Results: Among 487 patients, bilateral measurements were identified in 403 (82.8%) patients for M-Area and 226 (46.4%) patients for P-Area. On average, females had significantly smaller M-Area (3.40 cm 2 vs 4.14 cm2; $p<.05$) and P-Area (6.49 cm2 vs 10.7 cm2; $p<.05$) than males. M-Area correlated well with P-Area (r: 0.41, $p<0.001$). There were no differences in post-discharge mortality by gender. After adjusting for age, gender, injury severity score, and pre-existing conditions, multivariable Cox regression models revealed decreased survival associated with declining M-Area (HR: 0.79, 95% CI 0.63-0.99) and P-Area (HR: 0.88 95% CI 0.78-0.99). M-Area and P-Area performed equally well in best-fit models (0.66, 95% CI 0.61-0.71) vs (0.69, 95% CI 0.63-0.75).

Conclusion: In elderly trauma patients, M-Area is an equally valid and more readily available marker of sarcopenia and 2 year mortality than P-Area. Future study is needed to optimize this novel metric, which could aid in the early identification of at-risk patients who may benefit from aggressive multidisciplinary nutritional interventions and rehabilitation.

NOTES

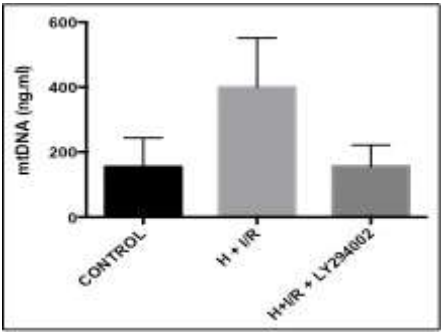
Session: XIA: Papers 49-59
Paper 51: 1:40 - 2:00 PM

Impact of a Novel PI3-Kinase Inhibitor in Preventing Mitochondrial DNA Damage and Damage Associated Molecular Pattern Accumulation: Results from the Biochronicity Project

George Black MD, Matthew Martin* MD, Jon Simmons* MD, David Muscat BS, Victor Pastukh Ph.D., Gina Capley MS, Olena Gorodnya MS, Mykhaylo Ruchko Ph.D., Mark Gillespie Ph.D., University of South Alabama

Invited Discussant: Zsolt Balogh, MD

Introduction: Despite improvements in the management of severely injured patients, development of multiple organ dysfunction syndrome (MODS) remains a morbid complication of traumatic shock. One of the key attributes of MODS is a profound bioenergetics crisis, for which the mediators and mechanisms are poorly understood. We hypothesized that metabolic uncoupling using an experimental PI3-kinase inhibitor, LY294004 (LY), may prevent mitochondrial abnormalities that lead to the generation of mitochondrial DNA (mtDNA) damage and the release of mtDNA damage associated molecular patterns (DAMPs) **Methods**: 16 swine were studied using LY294002 (LY), a non-selective PI3-KI: Animals were assigned to Trauma only (TO, N=3); LY drug only (LYO, N=3); and Experimental (N=10), trauma + drug (LY+T) groups. Both trauma groups underwent laparotomy, 35% hemorrhage, severe ischemia/reperfusion injury, and protocolized resuscitation.. A battery of hemodynamic, laboratory, histologic, and bioenergetic parameters were monitored. mtDNA damage was determined in lung, liver, and kidney using Southern blot analyses, while plasma mtDNA DAMP analysis employed PCR amplification of a 200 bp sequence of the mtDNA D-loop region. **Results**: Relative to control animals, H+I/R produced severe, time dependent decrements in hepatic, renal, cardiovascular, and pulmonary function accompanied by severe acidosis and lactate accumulation indicative of bioenergetics insufficiency. The H-I/R-animals displayed prominent oxidative mtDNA damage in all organs studied, with the most prominent damage in the liver. mtDNA damage was accompanied by accumulation of mtDNA DAMPs in plasma. Pre-treatment of H+I/R animals with LY294002 resulted in profound metabolic suppression, with approximate 50% decreases in O2 consumption and CO2 production. In addition, it prevented organ and bioenergetic dysfunction and was associated with a significant decrease in plasma mtDNA DAMPs to the levels of control animals (FIGURE). **Conclusion**: These findings show that H+I/R injury in anesthetized swine is accompanied by MODS and by significant mitochondrial bioenergetic dysfunction, including oxidative mtDNA damage and accumulation in plasma of mtDNA DAMPs. Suppression of these changes with the PI3K inhibitor LY294002 indicates that pharmacologically-induced metabolic uncoupling may comprise a new pharmacologic strategy to prevent mtDNA damage and DAMP release and prevent or treat trauma-related MODS.



NOTES

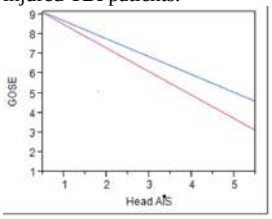
Session: XIA: Papers 49-59
Paper 52: 2:00 - 2:20 PM

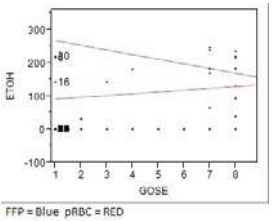
PREHOSPITAL PLASMA RESUSCITATION ASSOCIATED WITH IMPROVED NEUROLOGIC OUTCOMES IN TRAUMATIC BRAIN INJURY

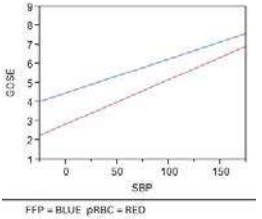
Matthew C. Hernandez MD, Cornelius Thiels DO, Kathleen Berns RN, Elizabeth Habermann Ph.D., Martin Zielinski* MD, James Stubbs MD, Donald Jenkins* MD, Scott Zietlow* MD, Mayo Clinic – Rochester

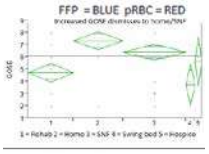
Invited Discussant: Jeremy Cannon, MD

Introduction: Trauma related coagulopathy and hypotension worsen secondary brain injury in polytrauma patients with TBI. Remote damage control resuscitation with blood products has been shown to be important both for mitigating hypotension and coagulopathy. Early administration of plasma may correct coagulopathies and reduce hypoperfusion. The Glascow Outcomes Score Extended (GOSE) and Disability Rating Scale (DRS) are validated scoring systems used to assess neurologic outcomes in TBI. We aim to compare the neurologic and functional outcomes of unstable patients with TBI receiving early resuscitation in the prehospital setting with either packed red blood cells (pRBC) or fresh frozen plasma (FFP). **Methods**: We identified all polytrauma patients > 15 years old with head abbreviated injury score (AIS) > 1 that underwent prehospital resuscitation with blood products between January 2002 and December 2013 using our Level I trauma center's prospectively collected trauma registry. Those who died in hospital, and those using warfarin were excluded. Glasgow Outcome Score Extended and Disability Rating Score at dismissal were calculated. Patients that received exclusively pre-hospital pRBC were compared to those receiving only FFP using ANOVA and multivariable standard least squares analyses.
Results: 77 patients met inclusion criteria, of whom 52% (n=40) received pre-hospital pRBC and 48% (n=37) received only FFP. There was no significant difference in patient age, gender, injury severity (severity of TBI, head AIS, GCS, head injury diagnosis, ISS), laboratory values on arrival to the ED (hemoglobin, INR, lactate), number of units of prehospital blood product given or length of stay (all p>0.05). Improved neurologic outcomes, a higher mean GOSE, was found in patients receiving FFP than those receiving pRBC (6.59 ±0.32 vs 5.62 ±0.31 p=0.04). Additionally, improved functionality, a lower mean DRS, was in patients that received FFP (4.32 ±0.71) compared to pRBC (7.1 ±0.91, p=0.02). Standard least squares regression demonstrated the following factors were independently associated with a decreased GOSE at dismissal: blood alcohol level >150 mg/dL (p=0.04), systolic blood pressure less than 118 mmHg (p<0.001), use of pRBC (p=.02), head AIS of greater than 3 (p<0.001), platelet count less than 194 x 109 per liter (p=0.005), and maximum amplitude on thromboelastography of less than 40 mm (p=0.02). **Conclusion**: In critically injured trauma patients with TBI, early resuscitation with FFP is associated with improved neurologic and functional outcomes at discharge compared to pRBC. Given the relatively poor outcomes of polytrauma patients with severe TBI, any improved in neurologic outcomes warrants further research. These data, although preliminary, support the use of FFP in the resuscitation of critically injured TBI patients.









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Session: XIA: Papers 49-59
Paper 53: 2:20 - 2:40 PM

SYNDECAN-1: A QUANTITATIVE MARKER FOR THE ENDOTHELIOPATHY OF TRAUMA

Erika Gonzalez Rodriguez MD, Sisse R. Ostrowski MD, DMSc, Jessica C. Cardenas Ph.D., Lisa A. Baer BSc, Jeffrey S. Tomasek MD, Hanne H. Henriksen BSc, Jakob Stensballe MD,Ph.D., Bryan A. Cotton* MD,MPH, John B. Holcomb* MD, Pär I. Johansson MD, DMSc, Charles E. Wade* Ph.D., University of Texas Health Science Center-Houston

Invited Discussant: Rosemary Kozar, MD, PhD

Introduction: The endotheliopathy of trauma (EoT) is a consequence of the downstream effects of hemorrhagic shock on the endothelial glycocalyx (EGL) and has been associated with increased mortality. We hypothesized that plasma syndecan-1, as a systemic marker of EGL breakdown, could be used to quantify EoT, potentially leading to the earlier identification of patients in need of endothelial repair.
Methods: Following IRB approval, we prospectively collected plasma samples from 410 trauma patients at the time of emergency room (ED) admission at our level-1 trauma center. Initial vital signs, routine biochemistries, injury severity scores (ISS) and outcomes were recorded. We quantified shed syndecan-1 and soluble thrombomodulin (sTM) from plasma. Receiver operating characteristic curve (ROC) analysis was used to determine the cutoff value of syndecan-1 that maximized the sum of sensitivity and specificity in predicting in-hospital mortality. Through ROC analysis (area under the curve =0.71, sensitivity=0.62, and specificity =0.73), we defined patients as EoT+ based on a syndecan-1 level of > 40 ng/ml (EoT- 40 ng/ml or less). Non-parametric statistical tests were used to assess differences between groups.
Results: Of the 410 patients evaluated, 34% (n=138) were EoT+ (66% were EoT-). Demographic data were comparable between groups. EoT+ patients had an increase incidence of blunt injury and higher ISS (Table). While they were admitted with a lower SBP, no differences in BE or Hgb were detected. Despite subtle differences in ED vital signs, a higher proportion of EoT+ patients required blood transfusions. The EoT+ group had a six fold increase in syndecan-1 levels and a doubling of mortality compared to the EoT- group (Table); both $p<0.05$. sTM level was independently associated with EoT+ ($p<0.001$) further confirming endothelial damage.

		No EoT (n=272)	EoT+ (n=138)
Arrival signs and lab:	Syndecan-1 (ng/ml)	17 (10,26)	108 (61,227)
	% Blunt Injury	67.9%	78.9%*
	SBP (mmHg)	128 (110, 115)	119 (91, 140)*
	Base Excess (mEq/l)	-2 (-5, 1)	-3 (-7, 1)
	Hemoglobin (g/dl)	13.2 (11.9, 14.4)	13.0 (11.2, 14.5)
Morbidity and mortality	ISS	16 (9, 25)	21 (10, 30)*
	% Transfused Blood	36.4%	71.7%*
	% Mortality	12.9%	25.4%*

*Significantly different between groups p<0.05.

Conclusion: A syndecan-1 level >40 ng/ml identified a group of patients with endothelial dysfunction (EoT) in the absence of definitive differences in admission physiology. EoT is associated with an increased requirement for transfusion of blood products and substantially increased mortality. Early EoT identification could target endothelial rescue therapy with the potential to improve outcome, but this warrants further research.

NOTES

Session: XIA: Papers 49-59
Paper 54: 2:40 - 3:00 PM

DAMAGE CONTROL LAPAROTOMY UTILIZATION RATES ARE HIGHLY VARIABLE AMONG LEVEL 1 TRAUMA CENTERS: PROPPR FINDINGS

Justin J. Watson MD, Jamison Nielsen DO, MBA, Kyle Hart MS, John Yonge MD, Christopher Connelly MD, Phillip Kemp Bohan BA, Hillary Sosnovske Barbara Tilley Ph.D., Gerald Van Belle Ph.D., Bryan Cotton* MD, MPH, Terence S. O'Keeffe* MD, MPH, Eileen Bulger* MD, Karen Brasel* MD, MPH, John Holcomb* MD, Martin Schreiber* MD, Oregon Health & Science University

Invited Discussant: Ben Zarzaur, Jr., MD, MPH

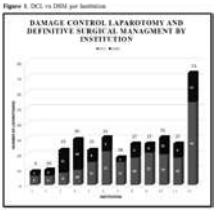
Introduction: Damage control laparotomy (DCL) is intended to limit deleterious effects from trauma induced coagulopathy. In cohort studies, DCL has been associated with a reduction in mortality, though there is increased risk for sepsis, abdominal abscess, respiratory failure, acute renal failure, ventral hernia and gastrointestinal fistula. We hypothesized that (1) DCL incidence would vary by institution; (2) mortality rates would correlate with DCL rates; (3) standard DCL criteria of pH, INR, temperature and major intra-abdominal vascular injury (MVI) would not adequately capture all patients receiving DCL.

Methods: Severely injured patients predicted to receive a massive transfusion admitted to 12 level 1 North American trauma centers were randomized based on transfusion ratios as described in the PROPPR trial. We analyzed patients that underwent an emergency laparotomy using a mixed-effects model with random effect for study site to compare patient outcomes after DCL versus closed definitive surgical management (DSM). Primary outcomes were 24-hour and 30-day mortality.

Results: 329 total patients underwent emergent laparotomy. 213 underwent DCL (65%) while 116 underwent DSM (35%). Patients undergoing DCL per institution ranged from 6-54 (33%-83%). Median ISS was higher in the DCL group, 29 (IQR: 13,34) versus 21 (IQR: 22,41) (p<0.001). Odds of having a DCL varied between sites (p=0.002). In a mixed-effects model, ISS and MVI were significant predictors of DCL (OR: 1.05, 95% CI: 1.02-1.07 and 2.7, 95% CI: 1.4-5.2) but mechanism was not. 24-hour mortality with DSM was 4%, versus 19% with DCL (p<0.001); 30-day mortality was 19% with DSM versus 28% with DCL (p<0.001). In a mixed-effects model of 30-day mortality, DCL was associated with death (OR: 2.54, 95% CI: 1.21-5.32, p=0.014). Other predictors included ISS and age (OR: 1.06, 95% CI: 1.04-1.09 and 1.03, 95% CI: 1.01-1.04). Blood treatment group, sex, and mechanism were not predictors of mortality. In both univariate and multivariable analyses there was no difference in 30-day mortality between institutions. The proportion of patients meeting any standard criteria for DCL was 135/213 in those receiving DCL (80%) and 53/116 (67%) i n those with DSM. Only INR > 1.5 (30% vs 6% p<0.001) and MVI (31% vs 16% p=0.003) was higher in DCL vs DSM while temperature and pH were similar. Sepsis (p<0.001) and VAP (p=0.02) occurred more frequently in DCL patients while MOF trended towards significance (p=0.06).

Table 1. Mixed-effects logistic regression model of 30-day mortality with a random effect for study site. N=319

	OR (95% CI)	p-value
DCL	2.54 (1.21, 5.32)	0.013
Blood group 1:1:2 (vs 1:1:1)	1.67 (0.92, 3.04)	0.094
Male	0.89 (0.44, 1.82)	0.758
Age (per year increase)	1.03 (1.01, 1.04)	0.004
ISS (per unit increase)	1.06 (1.04, 1.09)	<0.001
Penetrating (vs blunt) mechanism	1.19 (0.61, 2.32)	0.606



Conclusions: There is significant variation in DCL utilization between institutions. Despite this variance, there is no significant mortality difference detected between centers. DCL was associated with higher ISS, 30-day mortality, and morbidities including sepsis and VAP. Standard criteria only capture 80% of patients receiving DCL.

NOTES

Session: XIA: Papers 49-59
Paper 55: 3:00 - 3:20 PM

CLINICAL CORRELATES TO ASSIST WITH CTE DIAGNOSIS: INSIGHTS FROM A NOVEL RODENT REPEAT TBI MODEL

Gretchen Thomsen Ph.D., Annie Ma BS, Ara Ko MD, Megan Harada BS, Patricia Haro Jean-Philippe Vit Ph.D., Eric Ley* MD, Cedars-Sinai Medical Center

Invited Discussant: Michael Dubick, PhD

Introduction: Chronic traumatic encephalopathy (CTE) is a neurodegenerative disease linked to repetitive mild head injuries. Symptoms of CTE include changes in mood, behavior, cognition and motor function. However, CTE is only currently diagnosed post-mortem based on significant brain atrophy and the accumulation of phosphorylated tau (P-tau) within the cerebral cortex. As there is no strict clinical test for CTE and there is a lack of animal model that accurately represents this condition, understanding the mechanisms involved and therefore developing treatments is problematic. Here, we show that a novel rat model of recurrent traumatic brain injury (TBI) leads to permanent deficits in balance and motor function and that the degree of functional deficit predicts the severity of CTE-like brain pathology.

Methods: A total of 20 wild type (WT) rats were examined over a 12- or 25-week study period. At postnatal day 60, bilateral, closed skull, mild TBI was administered to 14 WT rats. 4 rats received 2, once-weekly TBI ("2TBI"), 10 rats received 5, once-weekly TBI ("5TBI") and 6 rats were used as sham controls. Rats were euthanized either 12 or 25 weeks following their first injury. Behavioral tasks including rotarod, rearing activity and BBB scoring for assessment of limb paralysis were performed at week 6. Deficits in these tasks relative to sham controls were classified as "strong", "mild/moderate", or “none”. Upon euthanasia, brain tissue was collected and stained for P-tau using an AT8 antibody (Thermofisher MN1020). Qualitative assessment of P-tau levels was performed and were designated with “+” (mild P-tau pathology, limited to superficial cortical layers around midline), “++” (mild/moderate P-tau pathology, extending into the deep cortical layers but localized near midline), or “+++” (widespread P-tau pathology, extending throughout the entire cortex). Cortical and corpus callosum thickness was calculated by averaging 3 measurements in each of 5 sections for each rat. Values presented are the percent difference relative to sham controls. Significance was defined as p value <0.05 (*).

Results: 5TBI rats euthanized at 25-weeks post-first injury with strong deficits in rotarod, rearing activity, and limb paralysis had 34% ± 2 cortical shrinkage and 68% ± 3 shrinkage of the corpus callosum, relative to sham controls. This is compared to 11% ± 6 cortical shrinkage and 33% ± 8 corpus callosum shrinkage observed in 5TBI rats also euthanized at 25-weeks, but presenting with mild/moderate deficits in rotarod, rearing activity and limb paralysis. 5TBI rats euthanized at 12-weeks post first injury that exhibited strong deficits in rotarod, rearing activity and limb paralysis had 25% ± 2 cortical shrinkage and 29% ± 3 corpus callosum shrinkage. 2TBI rats euthanized at 12-weeks post-first injury that had no deficits in rotarod, rearing activity, or limb paralysis, had 14% ± 8 cortical shrinkage and 22% ± 8 corpus callosum shrinkage. Upon histological exam, all rat brains with strong deficits had significant P-tau pathology relative to sham whereas mild/moderate and those with no deficits appeared to have increased P-tau levels relative to sham but reduced levels relative to those rats with strong behavioral deficits (see table below).

Table: Correlation of motor deficits with CTE-like brain pathology

group	deficit	rotarod	rearing	limb paralysis	cortical shrinkage	corpus callosum shrinkage	tau pathology
2TBI 12-week survival	none	21% ± 10 NS	11% ± 34 NS	5 ± 4 NS	14% ± 8*	22% ± 8*	+
5TBI 12-week survival	strong	76% ± 21*	66% ± 18*	17% ± 6*	25% ± 2*	29% ± 3*	++
5TBI 25-week survival	mild/moderate	49% ± 7*	15% ± 8 NS	2% ± 3 NS	11% ± 6*	33 ± 8*	+
5TBI 25-week survival	strong	96% ± 2*	86% ± 7*	17% ± 7*	34% ± 2*	68% ± 3*	+++

Conclusion: Our model of repeat TBI suggests that permanent deficits in motor function are correlated with CTE-like brain pathology. Testing patients on the basis of balance and motor coordination over time may be a predictive test to diagnose CTE. The use of this model will allow for understanding the mechanisms of CTE and developing therapeutic strategies.

NOTES

Session: XIA: Papers 49-59
Paper 56: 3:20 - 3:40 PM

D-DIMER MAY SIGNIFICANTLY REDUCE UNNECESSARY CT SCANS IN PEDIATRIC HEAD TRAUMA: A POTENTIAL FOR PECARN+

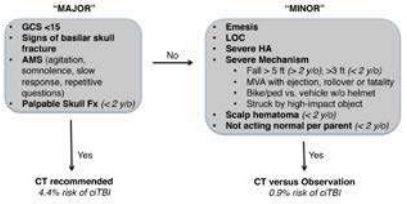
Simone Langness MD, Erin Ward MD, Jonathan Halbach DO, Katherine Davenport MD, Stephen Bickler MD, Karen Kling MD, Hari Thangarajah MD, University of California, San Diego

Invited Discussant: Brian Leininger, MD

Introduction: Blunt head trauma in children is responsible for nearly 600,000 emergency room visits annually in the US. Despite this high number, the rates of clinically important traumatic brain injury (ciTBI) are low. Head computed tomography (CT) remains the only definitive test to evaluate for ciTBI and judicious use is advocated to avoid excessive radiation exposure and cost. Clinical prediction rules, such as those developed by the Pediatric Emergency Care Applied Research Network (PECARN), were created to help guide clinicians in CT decision-making. PECARN, however, can be limited by patient age, incomplete history and subjective reports. As such, objective data may be an important addition. Previous work in low volume patient cohorts has suggested that quantitative D-dimer can predict the absence of ciTBI on head CT. We aimed to determine the impact of adding quantitative D-dimer to the PECARN prediction rules in avoiding unnecessary head CT scans following pediatric blunt head trauma.

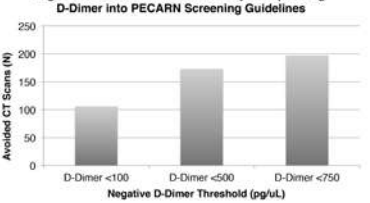
Methods: Retrospective review was performed for all patients presenting with blunt head injury to our Level I Pediatric Trauma Center from 2011-2013 who underwent evaluation with both CT head and serum D-dimer level. Patients were considered to meet “major” or “minor” PECARN screening criteria in accordance with the PECARN head trauma algorithm (Fig 1).

Figure 1. PECARN Screening Algorithm for CT Scanning After Pediatric Head Injury



Results: Of the 553 patients evaluated for ciTBI with a CT scan and D-dimer, 531 (96%) met PECARN criteria: 36.2% with “major” criteria and 59.9% with “minor” criteria (39.4% of which met multiple "minor" criteria). ciTBI was identified in 79 (14%) patients. D-dimer was >750 pg/uL in all patients with ciTBI. Adding a "negative" D-dimer to the current PECARN algorithm significantly improved patient selection for CT scanning. Using a D-dimer negative threshold value of <100, <500 and <750 pg/uL would have avoided 106, 173, and 197 head CT scans, respectively, without missing a ciTBI (Fig 2).

Figure 2. Avoided Head CT Scans by Incorporating D-Dimer into PECARN Screening Guidelines



D-Dimer Negative Threshold	<100 pg/uL	<500 pg/uL	<750 pg/uL
Head CT Scans Avoided	106	173	197
% Total Head CT Scans Obtained	19.2%	31.3%	35.6%

Conclusion: Low D-dimer can accurately predict the absence of ciTBI for pediatric patients following blunt head trauma. Incorporating D-dimer into current imaging algorithms can substantially improve patient selection and reduce the number of unnecessary head CT scans obtained for the evaluation of ciTBI.

NOTES

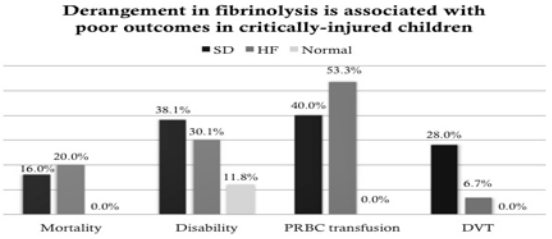
Session: XIA: Papers 49-59
Paper 57: 3:40 - 4:00 PM

ABNORMALITIES IN FIBRINOLYSIS ARE ASSOCIATED WITH VENOUS THROMBOEMBOLISM, MORTALITY, AND DISABILITY IN A PEDIATRIC TRAUMA POPULATION

Christine M. Leeper MD, Matthew D. Neal* MD, Christine McKenna CRNP, Jason Sperry* MD,MPH, Barbara A. Gaines* MD, Children's Hospital of Pitsburgh of UPMC

Invited Discussant: R. Todd Maxson, MD

Introduction: Abnormalities in fibrinolysis are associated with increased mortality in adult trauma populations. While hyperfibrinolysis (HF) and the emerging topic of fibrinolysis shutdown (SD) are potential prognostic indicators and treatment targets in adults, these derangements are not well-described in a pediatric trauma cohort.
Methods: Ongoing prospective analysis of highest level trauma activations age 0-18 presenting to our academic center since June 2015 with admission rapid thromboelastogram (TEG). Fibrinolysis shutdown was defined as clot lysis at 30 minutes (LY30) ≤0.8%, and hyperfibrinolysis was LY30≥3.0%. Variables of interest included demographics, admission vitals and labs, injuries, incidence of venous thromboembolism (screening ultrasound is performed for high risk ICU admissions), death and discharge disability (discharge to facility or dependence in functional independence measure category). Data were summarized and Wilcoxon rank-sum test, Chi-square or Fisher exact test were performed.
Results: To date, 75 patients are included: 34% (n=25) had SD on admission; 20% (n=15) had HF and 46% (n=34) of patients fell into normal range. Median age 9 years (3-13), ISS 18 (11-26), 75% blunt mechanism. Overall mortality rate was 9.5% (n=7) and DVT incidence was 10.8% (n=8). SD was significantly associated with elevated admission INR (p=0.022) and incidence of DVT (p=0.002). HF was associated with hemorrhagic injuries (p=0.007). Any abnormality in fibrinolysis (HF+SD) was associated with mortality (p=0.015), discharge disability (p=0.045), and need for packed red blood cell transfusion within 24 hours (p=0.020).
Conclusion: Children demonstrate high rates of inhibition (SD) and overactivation (HF) of fibrinolysis after injury. This significant derangement is associated with poor outcomes compared to physiologic fibrinolysis. Shutdown in particular represents a maladaptive systemic response, with admission coagulopathy and later development of hypercoagulable state. The addition of TEG to empiric transfusion protocols in pediatric centers should be considered as it contributes important prognostic and clinical information that may help tailor patient care.



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Session: XIA: Papers 49-59
Paper 58: 4:00 - 4:20 PM

1:1 TRANSFUSION STRATEGIES ARE RIGHT FOR THE WRONG REASON

Stephanie A. Savage* MD, MS, Ben L. Zarzaur* MD,MPH, Brian L. Brewer MD, Garrett H. Lim BS, Ali C. Martin BS, Louis J. Magnotti* MD, Martin A. Croce* MD, Timothy H. Pohlman* MD, Indiana Univesity School of Medicine

Invited Discussant: Yasuhiro Otomo, MD

Introduction: Early assessment of clot function in injured patients has identified acute coagulopathies following trauma. These abnormalities include a hypercoagulable state from excess thrombin generation, as well as an acquired coagulopathy due to a rapid depletion of fibrinogen. Efforts to address these abnormalities have resulted in earlier and more aggressive use of plasma, with an emphasis on 1:1 resuscitation. The purpose of this study was to describe these coagulopathies in varying hemorrhagic phenotypes from a cohort of severely injured patients.

Methods: All patients admitted as Level 1 trauma activations, who received at least one unit of packed red blood cells (PRBC) in the first 24 hours, were eligible for inclusion. Group-based trajectory modeling, using volume of transfusion over time, was used to identify specific hemorrhagic phenotypes within the cohort. The TEG profile of each subgroup was characterized and group features were compared. The primary outcome of interest was mortality.

Results: 330 patients were included. Four hemorrhagic phenotypes were identified – minimal (group 1); patients with large PRBC requirements later in the hospital course (group 2); massive PRBC usage (group 3) and PRBC transfusion limited to shortly after injury (group 4)(*Figure*). All patients were severely injured with an ISS >18. All groups had an R-time shorter than the normal range (3.2-3.5, p = NS). Patients in group 3 had longer K-times (1.8 vs. 1.2-1.3, p<0.05), significantly flatter alpha angles (66.7 vs. 70.4-72.8, p<0.05) and significantly weaker clot strength (MA 54.6 vs. 62.3-63.6, p<0.05). Group 3 had greater physiologic derangements at admission and worse overall outcomes(*Table*).

Figure. Group Trajectories for Blood Resuscitation

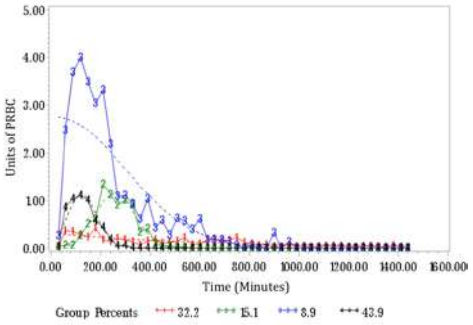


Table. Characteristics of Trajectory Groups

	Group 1	Group 2	Group 3	Group 4	p-value
% Blunt	77%	60%	56%	45%	p<0.05
ISS*	18 (10-29)	22 (13-29)	29 (20-50)	18 (10-28)	p<0.05
Admit SBP*	120 (94-135)	128 (105-143)	93 (49-116)	125 (95-142)	p<0.05
Admit pH*	7.29 (7.23-7.36)	7.33 (7.26-7.38)	7.03 (6.94-7.28)	7.29 (7.16-7.37)	p<0.05
Admit PTT*	27.5 (24.7-32.6)	28.6 (24.4-36.5)	36.7 (28.1-55.5)	26.4 (23.1-30.9)	p<0.05
# CAT+*	0.5 (0-2)	1 (0-2)	7 (6-10)	1 (0-2)	p<0.05
Total PRBC*	4 (3-8)	6 (4-10)	23 (19-31)	4 (2-8)	p<0.05
Total FFP*	2 (0-4)	2 (0-4)	15 (8-23)	0 (0-4)	p<0.05
Mortality	18%	30%	56%	16%	p<0.05

*reported as median (IQR)

Conclusion: Hemorrhagic phenotypes demonstrate rapid onset of clot formation in all subgroups but significantly suppressed thrombin burst and diminished clot strength in the most injured. This suggests that patients are both hypercoagulable, with early and precipitous clot formation, but that they also have a demonstrable hypocoagulability, potentially due to profound fibrinogen consumption and resultant hypofibringenimia. Survival benefits attributed to plasma may be a primary consequence of its fibrinogen component. Massive transfusion protocols may be more effective if the emphasis is placed on the early use of cryoprecipitate in preference to plasma in select patients.

NOTES

Session: XIA: Papers 49-59
Paper 59: 4:20 - 4:40 PM

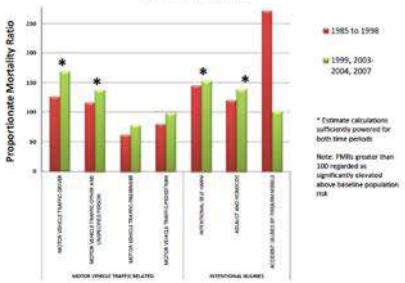
POPULATION-BASED ESTIMATES OF VIOLENCE-RELATED DEATH RATES FOR LAW ENFORCEMENT PERSONNEL: THE RISK OF DEATH ARE HIGHER AND INCREASING OVER TIME

Alexander L. Eastman* MD,MPH, Michael W. Cripps MD, Kareem R. Abdelfattah MD, Kenji Inaba* MD, Brian H. Williams MD, Christian T. Minshall* MD,Ph.D., Joseph P. Minei* MBA,MD, Kristan L. Staudenmayer* MD, MS UT Southwestern/Parkland

Invited Discussant: William Cioffi, MD

OBJECTIVE: Trauma-related deaths remain an important public health problem. One group susceptible to death from traumatic mechanisms are U.S. law enforcement officers (LEOs). We hypothesized that LEOs experienced a higher chance of violent death compared to the general U.S. population and that their risk has increased over time.
METHODS: The National Institute on Occupational Safety and Health (NIOSH) National Occupational Mortality Surveillance (NOMS) is a population-based survey of occupational deaths. It includes data for workers who died during 1985-1998 in one of 30 U.S states (EARLY period). Additional deaths were added from 23 U.S. states in 1999, 2003-2004, 2007 (LATE period). Mortality rates are estimated by calculating proportionate mortality ratios (PMR). A PMR above 100 is considered to exceed the average background risk for all occupations. All adults >18 years of age whose primary occupation was listed as “Law Enforcement Worker” were included in the analysis.
RESULTS: LEOs were more likely to die from an injury compared to the general population (Figure 1). The overall PMR for injury in EARLY was 111 (95% Confidence Interval [CI] 108-114, p<0.01), and for LATE was 118 (95% CI 110-127, p<0.01). Four mechanisms of death reached statistical significance: motor vehicle traffic (MVT)-driver, MVT-other, intentional self-harm, and assault/homicide. All 4 categories increased between time periods. The highest PMR in EARLY was associated with firearms (PMR 272, 95% CI 207-350, p<0.01). The highest PMR in LATE was associated with death due to being a driver in an MVT (PMR 169, 95% CI 136-207, p<0.01). There were differences in risk of death by race and gender. White females had the highest PMR due to Assault and Homicide (PMR 317, 95% CI 164-554, p<0.01). All groups had similar risks of death due to Intentional Self-Harm (PMR 130-171).
CONCLUSIONS: The risk of death for US LEOs is high and increasing over time. This suggests an at-risk population that requires further interventions. Targeted efforts based on risk factors, as well as gender, race and the risk for suicide, may assist with the development of prevention programs for this population.

Figure 1: Motor Vehicle Traffic and Assault Related Mortality for Law Enforcement Personnel



NOTES

SESSION XIB:

PAPERS #60 - #70

FRIDAY, SEPTEMBER 16, 2016, 1:00 PM – 4:40 PM

KONA BALLROOM 4-5

MODERATOR: JONATHAN TILSED, M.D.

RECORDER: SHARON HENRY, M.D.

Session: XIB: Papers 60-70
Paper 60: 1:00 - 1:20 PM

IMPACT OF EARLY OPERATIVE PELVIC FIXATION ON LONG-TERM FUNCTIONAL OUTCOME FOLLOWING SEVERE PELVIC FRACTURE

John P. Sharpe MD, MS, Louis J. Magnotti* MD, Wade C. Gobbell BS, Xin Huang BS, Edward A. Perez MD, Timothy C. Fabian* MD, Martin A. Croce* MD,
University of Tennessee Health Science Center – Memphis

Invited Discussant: Walter Biffl, MD

Introduction: Traumatic disruption of the pelvic ring is a significant cause of life-threatening hemorrhage. For those patients who survive the initial injury, these fractures are associated with long periods of immobilization and intense rehabilitation. Despite advancements in fixation techniques, there is little published information available regarding long-term functional outcomes in these patients. This study evaluated the impact of severe pelvic fractures on those long-term outcomes.

Methods: All patients with severe pelvic fractures over an 18-year period (ending September 2014) were identified from the trauma registry. Severe pelvic fractures were defined as those with vascular disruption, open book component with symphysis diastasis, or sacroiliac disruption with vertical shear. Using a telephone interview, functional outcome was measured using the Boston University Activity Measure for Post-Acute Care (AM-PAC) to assess mobility (normal>84) and daily activity (normal>84). Multiple regression analysis was used to identify potential predictors of functional outcome after severe pelvic fracture.

Results: 401 patients were identified: 241 (60%) men and 160 (40%) women. Overall mortality was 29%. Of the 285 survivors, follow-up was obtained in 145 (51%) patients. Mean follow-up was 8.3 years, with a maximum of 20 years. Mean age and injury severity score (ISS) were 53 years and 27, respectively. The mean number of RBC units transfused was 11.2 with an associated ICU length of stay of 13.3 days. Mean AM-PAC scores for mobility and daily activity were 55 and 53, respectively; both demonstrating significant impairment when compared to normal. Multiple regression analysis employing age, traumatic brain injury, transfusions, ISS and time to operative pelvic fixation identified time to pelvic fixation as the only predictor of decreased mobility (β = -0.43, p = 0.045) and activity (β = -0.27, p = 0.015) following severe pelvic fracture.

Conclusion: Prolonged time to operative pelvic fixation led to worse long-term functional outcomes in patients suffering severe pelvic ring disruption. In fact, multiple regression analysis only identified time to pelvic fixation as an independent predictor of significant impairment in both mobility and daily activities. Thus early fixation of the pelvic ring is the only potentially *modifiable* risk factor for decreased functional outcomes in patients with severe pelvic fractures.

NOTES

Session: XIB: Papers 60-70
Paper 61: 1:20 -1:40 PM

CERVICAL SPINE MRI IN PATIENTS WITH NEGATIVE CT: A PROSPECTIVE, MULTICENTER STUDY OF THE RESEARCH CONSORTIUM OF NEW ENGLAND CENTERS FOR TRAUMA (ReCONECT)

Adrian A. Maung* MD, Dirk C. Johnson MD, Kimberly Barre RN, Thomas Peponis MD, Tomaz Mesar MD, George C. Velmahos* MD, Ph.D., George Kasotakis MD,MPH, Ronald I. Gross* MD, Michael S. Rosenblatt* MBA,MD,MPH, Kristen C. Sihler* MD, Robert J. Winchell* MD, Walter Cholewczynski MD, Kathryn L. Butler MD, Stephen R. Odom MD, Kimberly A. Davis* MBA,MD, Yale School of Medicine

Invited Discussant: Kenji Inaba, MD

Introduction: Although cervical spine CT scan (CSCT) accurately detects bony injuries, it may not identify all soft tissue injuries. While some clinicians rely exclusively on a negative CSCT to remove cervical spine precautions in unevaluable patients or patients with midline cervicalgia, others use MRI for that purpose. The objective of this ReCONECT study was to determine the rates of abnormal MRI after a negative CSCT.

Methods: Blunt trauma patients who were unevaluable or had persistent midline cervicalgia and underwent an MRI of C-spine after a negative CSCT were enrolled prospectively in 8 Level I and II New England trauma centers over a 30-month period. Demographics, injury patterns, CT and MRI results, and any changes in cervical spine management were recorded.

Results: 767 patients had MRI because of cervicalgia (43.0%), inability to evaluate (44.1%) or both (9.4%). Mechanisms of injury included ground level fall (32.6%), road collisions (29.6%), fall from height (18.3%) and pedestrian struck (7%). MRI was abnormal in 23.6% of all patients, including ligamentous injury (16.6%), swelling (4.3%), vertebral disc injury (1.4%) and dural hematomas (1.3%). Patients with abnormal MRI were more likely male and were more severely injured (ISS 19 vs. 13, p=0.001). Rates of abnormal neurological signs or symptoms were not different among patients with normal vs. abnormal MRI. (15.2 vs. 18.8%, p=0.25). The c-collar was removed in 88.1% of patients with normal MRI and 13.3% of patients with an abnormal MRI. No patient required halo placement but 14 patients underwent cervical spine surgery after the MRI results. Eight of the fourteen had neurological signs or symptoms.

Conclusion: In a select population of patients with persistent cervicalgia or altered mental status, MRI identified additional disc or soft tissue injuries in 23.6% of patients in whom the final written interpretation of CT scan was normal. It is uncertain if this is a true limitation of CT technology or represents subtle injuries missed in the interpretation of the scan. The clinical significance of these abnormal MRI findings cannot be determined from this study group.

NOTES

Session: XIB: Papers 60-70
Paper 62: 1:40 - 2:00 PM

SYSTEMIC INTRAOPERATIVE ANTICOAGULATION DURING MAJOR ARTERIAL INJURY REPAIR: IMPLICATIONS FOR PATENCY AND BLEEDING

Zoe Maher MD, Brian Frank MD, Jeremy W. Cannon* MD, Lisa M. Capano-Wehrle MPH, Elizabeth Dauer MD, Joshua P. Hazelton DO, Andrea Lubitz MD, Huaqing Zhao Ph.D., Mark J. Seamon* MD, Temple University Hospital

Invited Discussant: Ian Civil, MBE, KstJ, ED, MBCHB, FRACS

Introduction: The role of systemic, intraoperative anticoagulation (SIAC) during the surgical repair of major arterial injuries is controversial. Any potential improvement in arterial patency must be weighed against the risk of hemorrhage in these critically injured patients. We hypothesized that SIAC would increase arterial patency without increasing bleeding complications.

Methods: We conducted a multi-institution, retrospective cohort study of trauma patients with major vascular injury from 2005-2013 in 3 urban, level I trauma centers. Arterial injuries of the neck, torso and extremities proximal to the elbows or knees requiring operative management were included. Our primary endpoint was the maintenance of arterial patency during the index hospitalization. Return to OR for bleeding was also assessed. The association between SIAC and arterial patency was evaluated using Chi-Square, t-test, Mann-Whitney U test and multiple logistic regression modeling where appropriate.

Results: Of 323 study patients, most were male (88%) and injured by gunshot (69%). Patients repaired with SIAC (n=154) were compared to those repaired without SIAC (n=169). No difference in age, gender, injury mechanism, admission hemodynamics, time to OR, associated venous injury or fracture was detected between SIAC and no SIAC groups (all $p>0.05$). Importantly, use of SIAC during arterial repair was associated with greater arterial patency rates (93% vs. 85%, $p=0.02$) without any increase in return to OR for bleeding (4% vs. 6%, $p=0.29$). After controlling for ISS, gender, admission hemodynamics, return to OR for revision or bleeding, postoperative anticoagulation and hospital LOS, multiple logistic regression determined that patients repaired with SIAC were three times as likely (OR 3.0, 95%CI 1.04–8.8, $p=0.04$) to maintain arterial patency as those repaired without. Patients who maintained arterial patency were then less likely to return to the OR (9% vs. 78%, $p<0.001$) and had shorter ICU (median 3 vs. 9 days, $p<0.01$) and hospital LOS (median 13 vs. 21 days, $p<0.01$).

Conclusion: Patients who underwent operative repair of major arterial injuries utilizing SIAC experienced better arterial patency without additional bleeding requiring return to OR as compared to those repaired without SIAC. Our data suggests that 1) SIAC should be utilized during arterial repair and 2) the attributable bleeding risk of SIAC may be overstated.

NOTES

Session: XIB: Papers 60-70
Paper 63: 2:00 - 2:20 PM

PREDICTING MORTALITY IN OLDER TRAUMA PATIENTS: A NOVEL METRIC BASED ON PRE-EXISTING CONDITIONS

Richard Y. Calvo MPH, Ph.D., Suzanne P. Lindsay MPH, Ph.D., MSW, Steven D. Edland Ph.D., Caroline Macera Ph.D., Deborah Wingard Ph.D., Lucila Ohno-Machado MD,Ph.D., Michael J. Sise* MD, Steven R. Shackford* MD, Scripps Mercy Hospital Trauma Service

Invited Discussant: Kristan Staudenmayer, MD, MSc

Introduction: Among the growing number of older trauma patients, those with pre-existing conditions (PEC) are at an increased risk of death. We developed a new metric to measure PEC burden that predicts trauma-related mortality among older trauma patients.
Methods: A cohort of 4,561 blunt-injured patients aged ≥55 years with low injury severity (TMPM Probability of Death <50%) admitted to a Level I trauma center from 01/06-12/12 were separated into development (80%) and test (20%) datasets. Trauma-related mortality, defined as death in-hospital or within 90 days of discharge, was captured using national and regional death data. PEC were extracted from the trauma registry and administrative claims data. Cox regression was used to develop our PEC-based model and a PEC risk score. Concordance statistics (c) was used to compare our risk score with others, including two PEC-based metrics (Charlson; Elixhauser) and three injury-based metrics (TRISS; TMPM; RTS). A separate cohort of 2,620 blunt-injured trauma patients aged ≥18 years with all levels of injury severity was used to evaluate our risk score's external validity.
Results: A total of 12 PEC were selected for our final model. In the test set, our risk score (c: 79.7) was superior to Charlson (c: 71.3), Elixhauser (c: 75.0) and all injury-based metrics (TMPM c: 61.8; TRISS c: 34.5; RTS c: 50.3) in predicting trauma-related mortality. For in-hospital mortality, only our PEC risk score demonstrated any appreciable discrimination over a 50% null value (c: 75.4, 95%CI: 58.7-92.1). In the validation set, all three PEC-based metrics demonstrated similar performance (PEC Risk Score c: 66.7; Charlson c: 69.3; Elixhauser c: 68.9) in predicting in-hospital mortality and outperformed all injury-based metrics.
Conclusion: Our 12-item prognostic risk score for trauma-related mortality performed well compared to other metrics. This suggests that the risk of death among older trauma patients is better predicted by PEC than physiologic or anatomic injury severity. Additional validation of our risk score is warranted.

Table. Concordance statistics (95% confidence interval) for mortality by dataset

	Test Dataset		Validation Dataset
Model Type	**Trauma-related Mortality**	**In-hospital Mortality**	**In-hospital Mortality**
PEC Risk Score	79.7 (76.7-83.7)	75.4 (58.7-92.1)	66.7 (52.2-81.3)
Charlson	71.3 (65.7-76.8)	59.4 (41.5-77.4)	69.3 (56.8-81.8)
Elixhauser	75.0 (69.8-80.1)	65.2 (47.1-83.2)	68.9 (55.4-82.3)
TMPM	61.8 (55.1-68.5)	44.4 (26.8-62.0)	51.7 (34.3-69.1)
TRISS	34.5 (18.9-50.0)	42.7 (23.4-62.1)	63.1 (47.3-78.8)
RTS	50.3 (38.4-62.2)	52.4 (37.9-66.9)	65.0 (50.7-79.3)

NOTES

Session: XIB: Papers 60-70
Paper 64: 2:20 - 2:40 PM

IDENTIFYING AUGMENTED RENAL CLEARANCE IN TRAUMA PATIENTS: VALIDATION OF THE AUGMENTED RENAL CLEARANCE IN TRAUMA INTENSIVE CARE (ARCTIC) SCORING SYSTEM

Jeffrey F. Barletta B.S., Pharm.D., FCCM, Alicia J. Mangram* MD, Marilyn Byrne RN, Joseph F. Sucher MD, Alexzandra K. Hollingworth MD, Francis R. Ali-Osman MD, Gina R. Shirah MD, James K. Dzandu Ph.D., Honor Health- John C. Lincoln Medical Center

Invited Discussant: Lewis Kaplan, MD

Introduction: Augmented renal clearance (ARC) is common in trauma patients and associated with subtherapeutic antimicrobial concentrations. Early identification of patients with ARC is necessary to maximize antimicrobial doses and minimize treatment failure. The purpose of this study was to report the incidence of ARC, identify ARC risk factors and develop a predictive scoring model called ARCTIC (Augmented Renal Clearance in Trauma Intensive Care) that is specific to trauma patients.

Methods: Consecutive trauma patients who were admitted to the intensive care unit with a timed urine collection for measured creatinine clearance (CrCl) were considered for inclusion. Patients were excluded if their serum creatinine (SCr) was > 1.3 mg/dL. Identified patients were stratified based on the presence of ARC which was defined as a measured CrCl ≥ 130 ml/min. Demographics, comorbidities and trauma-specific variables (injury type, severity and mechanism) were then compared and multivariate analysis was performed. Using the results from the multivariate analysis, a weighted scoring system was constructed and evaluated using receiver operating characteristic (ROC) curve analysis. ARCTIC score cut-offs were determined based on sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV).

Results: There were 133 patients with a mean age of 48±19 years and SCr of 0.8 ± 0.2 mg/dL. The most common injury type was head injury (48%) and 62% required mechanical ventilation. The mean measured CrCl was 168 ± 65 ml/min and the incidence of ARC was 67%. Multivariate analysis revealed the following risk factors for ARC [odds ratios (95% CI)]: age < 56 [58 (5.2 – 659)], age 56 to 75 [13.5 (1.2 – 152)], SCr < 0.7 mg/dL [15.2 (3 - 53)] and male gender [6.9 (1.9 – 25)]. Using these results, the ARCTIC scoring system was: 4 points if age < 56, 3 points if age 57 – 75, 3 points if SCr < 0.7 mg/dL and 2 points if male gender. ROC curve analysis revealed an area (95% CI) of 0.813 (0.735 – 0.892), p<.001. An ARCTIC score of ≥ 6 had a sensitivity, specificity, PPV and NPV of 0.843, 0.682, 0.842 and 0.682, respectively.

Conclusion: The incidence of ARC in trauma patients is high. The ARCTIC score represents a practical, pragmatic system that can be used at the bedside to predict ARC. An ARCTIC score ≥6 represents a good cut-off to screen for ARC where antimicrobial adjustments should be considered. Future studies are needed to determine the association between ARCTIC score and trauma patient management outcomes.

NOTES

Session: XIB: Papers 60-70
Paper 65: 2:40 - 3:00 PM

THE FRAIL SCALE: A USEFUL TOOL FOR BEDSIDE SCREENING OF GERIATRIC TRAUMA PATIENTS

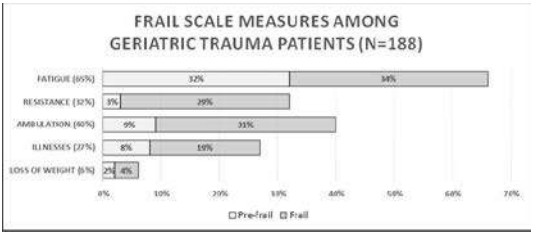
Cathy A. Maxwell Ph.D., Mary S. Dietrich Ph.D., Richard S. Miller* MD, Vanderbilt University Medical Center

Invited Discussant: Orlando Kirton, MD, MBA

Introduction: A 2013 consensus conference recommended routine screening for frailty by frontline clinicians. The validated FRAIL Questionnaire consists of 5 items derived from the Fried phenotype (4) and Rockwood deficit accumulation (1) models of frailty. Using data from our study on one-year geriatric trauma outcomes, we derived a 5-item FRAIL Scale score for 188 geriatric trauma patients to examine the influence of pre-injury physical frailty (as measured by FRAIL) on one-year outcomes. We hypothesized that FRAIL scores would predict function and mortality at 1-year post-injury.

Methods: Design: Secondary data analysis from a prospective cohort study. Participants: patients ≥ age 65 admitted through the ED between October 2013 and March 2014. Setting: Level I trauma center. Procedure: The five items of the FRAIL Scale instrument (**F**atigue, **R**esistance, **A**mbulation, **I**llnesses, **L**oss of weight) were generated. A pre-injury FRAIL score was created for each patient. Data analysis: Frequencies, measures of central tendency, linear and logistic regression.

Results: Mean age: 77.6 (SD 8.9), median injury severity score: 10 (IQR: 9-17), median comorbidity index: 3 (IQR: 0-9). Eighty-eight patients (47%) scored ≥ 2 on the AD8 dementia screen, indicating possible dementia. Among 188 admitted patients, 64 (34%) screened frail (FR AIL score ≥ 3), 71 (38%) screened pre-frail (score: 1-2) and 53 (29%) screened non-frail (score: 0). Frequencies (%) were derived for each component of the FRAIL scale: fatigue (N=123, 65%), ambulation (N=76, 40%), resistance (N=61, 32%), illnesses (N=51, 27%), loss of weight (n=11, 6%). One-year follow-up was completed on 176 (94%) patients for functional status (Barthel Index), and 184 patients (96%) for mortality. Multivariate regression: **Function:** Regression analysis revealed that after controlling for age, comordities, injury severity, and cognitive impairment (AD8), pre-injury FRAIL scores explained ~29% of the variability in physical function (β=-0.53, p<0.001) at 6-months post-injury. This association remained with function at one-year post-injury (N=129, β=-0.36, p<0.001). **Mortality (1-year):** 47 patients (26%) died within one year of admission. Logistic regression analysis revealed that after controlling for those same variables, the higher the pre-injury FRAIL score the greater the likelihood of mortality within one year (O.R.=1.74, p=0.001; CI: 1.27-2.39).



Conclusion: The 5-item FRAIL Questionnaire predicts functional status (as a measure of disability) and mortality at one-year among geriatric trauma patients. The FRAIL Scale is a useful tool for bedside frailty screening by clinicians. Incorporation of physical frailty measures into medical records and trauma registries will facilitate patient-centered care and provide a measure for risk adjustment with quality improvement efforts and research studies in trauma care settings.

NOTES

Session: XIB: Papers 60-70
Paper 66: 3:00 - 3:20 PM

APPLICATION OF EXOGENOUS PMN TO THE AIRWAY RESCUES BACTERIAL OVERGROWTH INITIATED BY TRAUMA DAMPS

Kiyoshi Itagaki Ph.D., Jing Zhang MD, Ingred Rica Ph.D., Dave Gallo BS, Leo E. Otterbein Ph.D., Beth Israel Deaconess Medical Center

Invited Discussant: Ronald Maier, MD

Introduction: Trauma is the leading cause of death in persons under 45. Nosocomial pneumonia is common in trauma patients so interventions to prevent and treat nosocomial pneumonia may improve outcomes. Our prior work strongly suggests that tissue injury predisposes to nosocomial pneumonia because mitochondrial debris (MTD) originating from injured cells contains damage-associated molecular patterns (DAMPs). These reduce neutrophil (PMN) migration into the airway when bacterial inoculation occurs after injury. This suggested putting normal PMN into the airway might be beneficial.

Methods: All experiments were approved by the Institutional Animal Care and Use Committee. We randomly divided CD-1 mice into three experimental groups. **Group-1** got saline injected intra-peritoneal (*i.p.*) at T=-3h and bacteria (*S. aureus*, 1x106 CFU in 50 µL PBS) injected intra-tracheal (*i.t.*) at T=0. **Group-2** got MTD (isolated from 10% of a CD-1 mouse liver) *i.p.* at T=-3h and bacteria *i.t.* at T=0. **Group-3** got MTD *i.p.* at -3h, bacteria *i.t.* at T=0 and bone marrow (BM-)PMN (2x106 in 50 µL saline from CD-1 mice) *i.t.* at +3 h. Injection of bacteria and BM-PMN *i.t.* were performed using a catheter and holding mice vertically to allow passive, atraumatic delivery of the inoculum to the alveoli. Animals were sacrificed at +20h. Bacterial clearance was assayed first by culturing brochoalveolar lavage fluid (BALF, n>12/group) on agar plates with bacterial presence (CFU) in BAL and lung homogenates normalized to Group-1 values. We then repeated the experiments (n>13/group) culturing lung homogenates. Statistical analysis was done by one-way ANOVA. In preliminary experiments, PMN infusion *i.t.* had no untoward effects on recipient animals. Furthermore, infusion of PMN across strains (CD-1 vs. C57BL/6) also has no effect on the recipients.

Results: Results (mean ± SE) are shown in the figures below. Our initial determinations of bacterial clearance used BALF. Here we found that, as expected, MTD given *i.p.* decreases lung clearance of bacteria. But remarkably, exogenous BM-PMN given *i.t.* 3 hours after bacterial inoculation returned clearance to normal levels (*p=0.002) (Figure 1). Experiments using lung homogenates showed a similar trend (P=0.027; saline vs. MTD, p=0.015; MTD vs. MTD+PMN) (Figure 2) with experiments still ongoing.

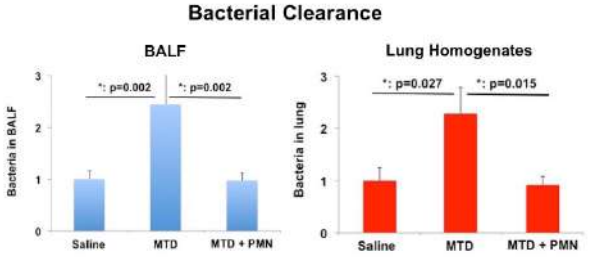


Figure 1. Figure 2.

Conclusion: These data further support that mitochondrial DAMPs can cause PMN redistribution toward injured sites. Thus fewer PMN may reach the inoculated lung, reducing bacterial clearance. This model may mimic clinical conditions where PMN migrate towards injured sites limiting the number of PMN available to clear pneumonia. Moreover, instillation of normal PMN into the trachea clearly rescued the suppression of bacterial clearance cause by mitochondrial DAMPs using the BALF model. Preliminary experiments using lung homogenate methods also support that finding. Moreover, intra-tracheal PMN infusion did not cause adverse effects. Thus intra-tracheal PMN instillation is worthy of study as a potential adjunctive therapy aimed at decreasing the morbidity of bacterial lung infections in trauma patients.

NOTES

Session: XIB: Papers 60-70
Paper 67: 3:20 - 3:40 PM

PARENTERAL AND ENTERAL NUTRITION HAVE DIVERGENT EFFECTS ON RIBONUCLEOTIDE SYNTHESIS, NITROGEN AND KREBS CYCLE METABOLISM AFTER TRAUMATIC INJURY

Brodie Parent MD, Max Seaton MD, Danijel Djukovic Ph.D., Brittany Wheelock Lauren Jacobson Daniel Raftery Ph.D., Grant E. O'Keefe* MD,MPH, University of Washington

Invited Discussant: Christopher Dente, MD

Introduction: Artificial nutritional support is important in the care of critically ill trauma patients. While the enteral (EN) route is preferred, there are circumstances when parenteral nutrition (PN) is considered necessary. EN is associated with fewer nosocomial infections and lower overall morbidity than PN. However, potential biologic mechanisms for differences are not clear. We sought to better understand how EN and PN influence metabolic pathways in critically ill trauma victims using system-wide metabolomics. We hypothesized that metabolic responses to the institution of enteral and parenteral nutrition would be different in ways that might help us understand how to optimize their use.

Methods: We enrolled subjects prospectively over 7 months in 2015 at an urban, level-one trauma center. Subjects were included if they were started on either enteral nutrition (EN) or parenteral nutrition (PN) during their inpatient admission and consented to participate. Plasma samples were obtained between 1-12 hours prior to starting artificial nutrition, and 3 and 7 days later. All samples were stored at -80 Celsius, and then analyzed with liquid chromatography and mass spectrometry. We assessed differences in plasma metabolite concentrations and used principle component analyses and multiple linear regression to select biomarkers of interest.

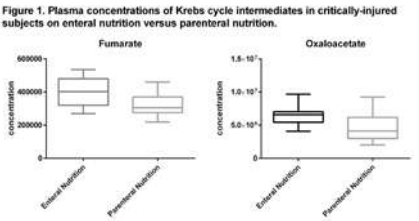


Figure 1. Plasma concentrations of Krebs cycle intermediates in critically-injured subjects on enteral nutrition versus parenteral nutrition.

Results: 20 subjects were enrolled (10 EN and 10 PN) and sampled over 7 days. The median age was 41 and the median ISS was 30. There were no differences in baseline characteristics between the two groups, except for relatively more blunt-trauma mechanisms in the EN group. A total of 60 plasma samples were collected and 112 metabolites per sample were analyzed. Relative to EN subjects, PN subjects showed an impaired Krebs cycle metabolism (decreased fumarate and oxaloacetate, $p<0.05$, Figure 1) and decreased nitrogen turnover (decreased urea cycle intermediates: citrulline, ornithine and urea, $p<0.05$). Finally, EN subjects showed increasing ribonucleic acid (RNA) synthesis over time (increased uridine, cysteine and oxypurinol, $p<0.05$), but this was not observed in PN subjects.

Conclusion: Metabolic differences between enteral and parenteral therapy are evident. EN is associated with amino-acid anabolism and increasing RNA synthesis over time. However, PN is associated with impairments in RNA synthesis, Krebs cycling and nitrogen metabolism. These data suggest that PN contributes to less effective energy metabolism and delayed protein synthesis. Our data support the notion that parenteral nutrients are utilized less effectively than enteral nutrients. Biomarkers reported in this study can be rapidly obtained and may be useful in guiding both enteral and parenteral nutritional therapy in critically ill patients.

NOTES

Session: XIB: Papers 60-70
Paper 68: 3:40 - 4:00 PM

EVALUATION OF GUIDELINES FOR INJURED CHILDREN AT HIGH RISK FOR VTE: A PROSPECTIVE OBSERVATIONAL STUDY

Rachel Landisch MD, Laura Cassidy Ph.D.,RN, Kristin Braun RN, Rowena Punzalan MD, Sheila Hanson MD, David Gourlay* MD, Children's Hospital of Wisconsin

Invited Discussant: Denis Bensard, MD

Introduction: Venous thromboembolism (VTE) pharmacologic prophylaxis is a widely accepted practice in adult trauma patients to prevent associated morbidity. However, VTE prophylaxis has not been standardized in injured pediatric patients. Our institution identified factors potentially associated with a high risk of VTE in critically injured pediatric patients that led to the development and implementation of a VTE prophylaxis guideline.

Methods: Data were prospectively collected on injured children from 8/2010-8/2015. Pharmacologic prophylaxis was indicated for patients identified by the guidelines as high risk for VTE. Prophylaxis was deferred and a screening ultrasound (US) performed if the high risk VTE patients were also at high risk for bleeding. To assess the accuracy of predicting confirmed cases of VTE, stepwise logistic regression analysis was used to measure the association of individual risk factors with VTE controlling for age ($\geq$ 13 years). A receiver operating characteristic (ROC) curve measured the accuracy of the final model to predict a VTE.

Results: Of 4092 trauma patients, 588 were admitted to the ICU of which the guidelines identified 199 as high risk. VTE occurred in 4% (23/588) of the ICU population and 10% (20/199) of the high risk. The median age of VTE patients in the ICU was 9.7 years. The statistically significant predictors ($p<0.05$) of VTE in the multivariate model included presence of a central venous catheter (OR=5.2), inotropes (OR=7.7), immobilization (OR=5.5) and a Glasgow Coma Scale (GCS) < 9 (OR=1.3). The area under ROC curve of this model was 0.92, demonstrating its excellent predictive ability.

Conclusion: The results demonstrate that critically injured pediatric patients are at high risk for VTE. The analysis established a subset of factors that significantly increase the risk of a VTE. Identification of these risk factors should be incorporated into standardized protocols for earlier detection and prevention.

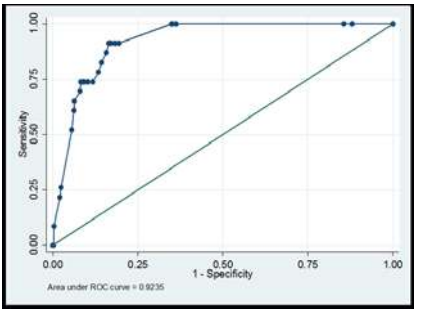


Figure 1. ROC analysis to predict VTE based on age, central venous catheter, inotropes, immobilization, and GCS.

NOTES

Session: XIB: Papers 60-70
Paper 69: 4:00 - 4:20 PM

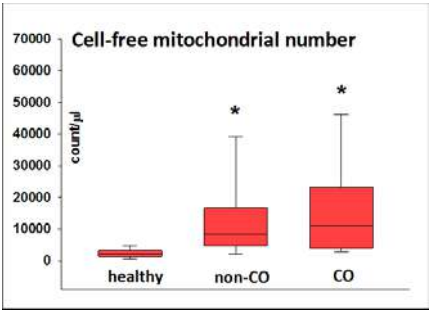
TROJAN HORSE OUT OF BARN: TRAUMA PATIENTS' CELL FREE SERA CONTAINS FUNCTIONAL MITOCHONDRIA INDICATING POOR OUTCOME

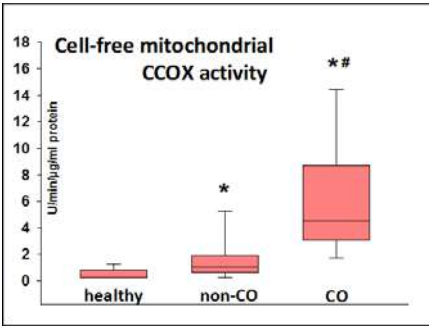
Eszter Tuboly Ph.D., Daniel McIlroy BS,MD, MRCS (eng.), Natalie Lott RN, Gabrielle Briggs Ph.D., Zsolt J. Balogh* MD,Ph.D., John Hunter Hospital, University of Newcastle

Invited Discussant: James Hoth, MD

Introduction: Cell free mitochondrial DNA (mtDNA) is a potent driver of postinjury inflammation and suggested as a marker of poor outcome. The cellular origin and the mechanism of mtDNA release is largely unknown. We hypothesized that trauma patients' sera contains cell free mitochondria as potential stage in the mechanism of mtDNA release.

Methods: Prospective cohort study was performed on 70 patients (72% male, Age:41±17; ISS:19±13; BD:0.2±3) requiring major orthopaedic trauma surgery and 18 healthy controls (Age:36±7). De-cellularized plasma was investigated for cell free mitochondria with flow cytometry (Mitotracker Deep Red; count/μL), mtDNA concentration was quantified by RT-PCR (ng/mL). Spectrophotometry was used to determine the cytochrome-c oxidase (CCOX) activity of the acellular plasma (U/min/μg/ml protein). The outcomes were SIRS, MOF and Sepsis (complicated outcome, CO).





Results:15 patients developed CO and their demographics, injury and shock severity was comparable to the 55 no-CO patients. Trauma patients' sera contained significantly more cell free mitochondria ($p< 0.001$) than controls. Controls had significantly lower CCOX activity ($p<0.001$) than trauma patients. CO patientshad significantly higher CCOX activi ty than non-CO patients ($p< 0.05$) but no difference was detected in their mtDNA concentration ($p= 0.5340$).There was no correlation between the extracellular CCOX activity and ISS or BD. There was a negative correlation ($r= -0.327$, $p< 0.05$) between the extracellular CCOX activity and mtDNA concentrations in trauma samples.

Conclusion:We discovered that trauma patients have large number of functional cell free mitochondria in their sera, which could be the source of the proinflammatory cell free mtDNA. Increased preoperative cell free mitochondrial CCOX activity is associated with poor outcome in patients with similar age, injury and shock severity.

NOTES

Session: XIB: Papers 60-70
Paper 70: 4:20 - 4:40 PM

IMPACT OF INCLUDING HIGHEST GCS MOTOR SCORE IN THE RISK-ADJUSMENT OF TRAUMATIC BRAIN INJURY MORTALITY

David Gomez MD,Ph.D., James Byrne MD, Wei Xiong Ph.D., Aziz Alali MD, Ph.D., Haris Subacius Ph.D., Christopher Hoeft Avery B. Nathens* MD, MPH, Ph.D.,
University of Toronto, Department of Surgery

Invited Discussant: Adil Haider, MD, MPH

Introduction: The Glasgow Coma Scale (GCS) is the most widely accepted and utilized measure of traumatic brain injury (TBI) severity. Traditionally, the first GCS score is used to assess baseline risk and to define severe TBI. However, the GCS wasn't only designed to assess patients at one point in time, but rather to identify and quantify changes in neurological status over time. We postulated that the post-resuscitation GCS, or highest GCS in the first 24 hours, might be a better predictor of death. Our objective was to evaluate the impact of including the highest GCS score in risk-adjustment models for the purpose of trauma center performance benchmarking.

Methods: Data were derived from the American College of Surgeons Trauma Quality Improvement (TQIP) analytic dataset (Jan 2014 – March 2015). We focused our analysis on the isolated severe TBI cohort which included patients =>16 years, with head Abbreviated Injury Scale (AIS) scores => 3, total GCS =<8, and AIS scores =< 2 in all other body regions. We used only the motor component (mGCS) to avoid confounding with endotracheal intubation. Only centers reporting both initial and highest mGCS were included. Different risk-adjustment models, which included a different combination of initial and highest mGCS scores as covariates as well as additional patient and injury characteristics, were created. Model performance and fit were then evaluated across all models. In addition, the external benchmarking results (i.e. change in center outlier status, change in decile, and Odds Ratio change >0.5 standard deviation) of all models was compared to a reference model using initial mGCS only.

Results: 6,768 patients across 232 centers met severe TBI cohort criteria and had available highest mGCS. Initial and highest mGCS scores were different in 49% of patients; with highest mGCS scores being lower in 1.2% and higher in 47.8% of patients. Model performance was optimal when both initial and highest mGCS were included in the model as evidenced by C-index, HL p value, AIC, and adjusted R2. When both were included as covariates, ten centers changed outlier status compared to a reference model using initial mGCS only. In addition, almost half of centers (46.6%, n=108) exhibited a significant change in their risk-adjusted odds ratio of death when both initial and highest mGCS were included as covariates compared to using initial mGCS only.

Inclusion of mGCS across models	Change in outlier status	Change in decile	Odds ratio change >0.5 SD
Initial mGCS only	reference	reference	reference
Highest mGCS only	9 (3.9%)	180 (77.6%)	107 (46.1%)
Initial and Highest mGCS	10 (4.3%)	177 (76.3%)	108 (46.6%)

Conclusions: The inclusion of highest mGCS score in risk-adjustment models of severe traumatic brain injury leads to improved model performance and potentially meaningful changes in risk-adjusted performance ranking of centers.

NOTES

MILITARY AWARDS

FRIDAY, SEPTEMBER 16, 2016, 4:50 PM – 5:00 PM

GRAND BALLROOM

PRESIDING: RAYMOND FANG, M.D., CHAIR, MILITARY LIAISON COMMITTEE

AAST ANNUAL BUSINESS MEETING *(FELLOWS ONLY)*

FRIDAY, SEPTEMBER 16, 2016, 5:00 PM – 6:15 PM

GRAND BALLROOM

AAST BANQUET/LUAU

FRIDAY, SEPTEMBER 16, 2016, 6:30 PM – 9:00 PM

PALACE LAWN

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., M.P.H., Ph.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.

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.

SESSION XII:

QUICKSHOTS I

SATURDAY, SEPTEMBER 17, 2016, 8:00 AM – 9:18 AM

GRAND BALLROOM

MODERATOR: DAVID LIVINGSTON, M.D.

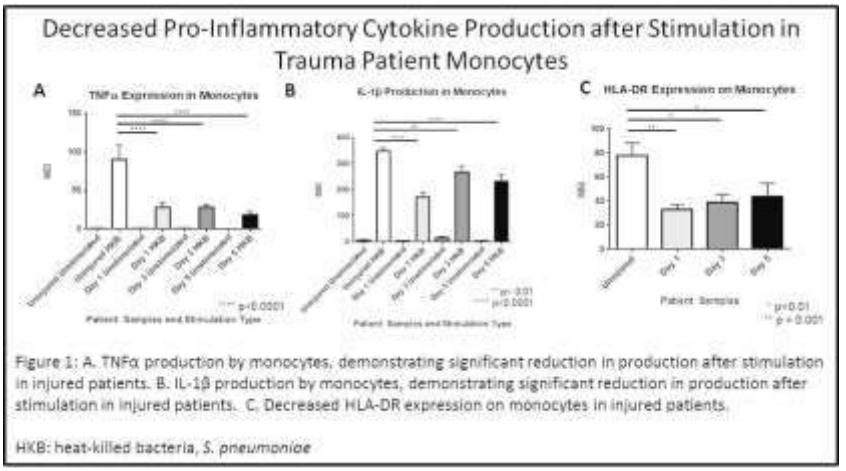
Session: XII: Quickshot Session I
Paper QS1: 8:00 - 8:06 AM

TRAUMA DECREASES MONOCYTE INFLAMMATORY ACTIVITY DESPITE PERIPHERAL EXPANSION

Anupamaa Seshadri MD, Gabriel Brat MD, Brian K. Yorkgitis DO, Joshua Keegan BS, James Dolan BA, Ali Salim* MD, Reza Askari* MD, James Lederer Ph.D., Brigham and Womens Hospital

Invited Discussant: Peter Rhee, MD, MPH

Introduction: Trauma induces a complex immune response that requires a systems biology research approach. Here, we use a novel technology, cytometry by time-of-flight mass spectrometry (CyTOF), to characterize the multi-cellular response to severe trauma.
Methods: Peripheral blood mononuclear cells (PBMCs) from trauma patients with injury severity score > 20 (n=10) were collected at day 1, 3, and 5 after injury, as well as from age- and gender-matched controls. Samples were stained with a 38-marker lymphoid-cell phenotyping CyTOF staining panel. Separately, matched cell samples were stimulated with heat-killed *S. pneumoniae* and stained with a 38-marker cytokine CyTOF staining panel.
Results: CyTOF staining profiles showed that monocytes significantly increased as a percentage of total circulating cells and in their expression of the proliferation marker Ki-67. However, when stimulated with bacteria, diminished relative pro-inflammatory cytokine production was seen. Specifically, TNFα and IL-1β production was significantly less robust in trauma patient monocytes at all time points studied (Figure 1A and 1B). Furthermore, HLA-DR surface expression on monocytes was significantly decreased in trauma samples at all time points (Figure 1C), indicating decreased ability to present antigens for cell-mediated immune function.
Conclusion: These results are part of the first comprehensive evaluation of changes in peripheral blood immune cell populations over time after injury, demonstrating specific trauma-induced cellular phenotypic changes. We found significant changes in trauma patients' monocyte pro-inflammatory cytokine production when stimulated, as well as decreased HLA-DR expression on monocytes. Together, this data shows that while peripheral monocyte populations may expand after injury, these cells show significant loss of pro-inflammatory function that could increase susceptibility to infection after trauma.



NOTES

Session: XII: Quickshot Session I
Paper QS2: 8:06 - 8:12 AM

THE ALVARADO SCORE SHOULD BE USED TO REDUCE EMERGENCY DEPARTMENT LENGTH OF STAY AND RADIATION EXPOSURE IN SELECT PATIENTS WITH ABDOMINAL PAIN

Jamie J. Coleman MD, Tyrone Rogers MD, Bryan W. Carr MD, Matthew S. Field MD, Ben L. Zarzaur* MD, MPH, Stephanie A. Savage* MD, Peter M. Hammer MD, Brian L. Brewer MD, David V. Feliciano* MD, Grace S. Rozycki* MBA, MD, Indiana Univesity School of Medicine

Invited Discussant: Elizabeth Benjamin, MD

Introduction: Abdominal pain is one of the most common reasons patients seek treatment in emergency departments (ED), and computed tomography (CT) is frequently used to aid in a diagnosis; however, length of stay in the ED and risks of radiation remain a concern. The hypothesis in this study was that the use of the Alvarado Score (AS) could diagnose and rule out acute appendicitis (AA) in a certain proportion of patients, thereby reducing the overall number of unnecessary CT scans and decreasing emergency department (ED) length of stay.

Methods: A retrospective review of patients who underwent CT to rule out AA from January 1st, 2015, to December 31st, 2015, was performed. Data collected from the electronic medical record included patient demographics, past medical history, ED documentation, operative interventions, complications, and length of stay. The AS was then calculated for each patient from the electronic medical record. Time to CT completion and length of stay in the ED were calculated utilizing the time the patient was seen by ED staff, time of CT order, and time of CT findings reported by radiology.

Alvarado Score Calculation	
RLQ tenderness	2 points
Rebound tenderness	1 point
Temp > 37.3° C	1 point
Migration of pain to RLQ	1 point
Nausea or vomiting	1 point
Anorexia	1 point
WBC > 10,000	2 points
WBC left shift	1 point
Total	**10 points**

Results: 492 patients (68.1% female, median age 33) underwent CT to rule out AA during the study period. The majority of CT scans (70%) did not have findings consistent with AA. The median AS for patients diagnosed with AA on CT scan was 7, and was significantly higher than those without (AS=3). 100% of female patients with an AS of 10 and male patients with an AS of 9 or 10 had AA confirmed by surgical pathology. Conversely, ≤ 5% of female patients with an AS ≤ 2 and 0% of male patients with an AS ≤ 1 were diagnosed with AA. There were 106 patients (21.5%) found to have AS within these ranges. Collectively, these 106 patients spent 10,239 minutes in the ED from the time a CT scan was ordered until the radiologist's report.

Conclusion: Males with an AS of ≥ 9 and Females with AS of 10 should be considered candidates for treatment of AA without further studies. Males with AS of 1 or less and females with AS of 2 or less can be safely discharged with close follow-up if symptoms change. Increased time for observation or CT could help aid diagnosis of AA in males with AS of 2-8 and in females with AS of 3-9. By using AS, a significant proportion of patients can avoid the radiation risk, the increased cost, and increased length of stay in the ED associated with CT.

NOTES

Session: XII: Quickshot Session I
Paper QS3: 8:12 - 8:18 AM

"NO ZONE" APPROACH IN PENETRATING NECK TRAUMA REDUCES UNNECESSARY COMPUTED TOMOGRAPHY ANGIOGRAPHY AND NEGATIVE EXPLORATIONS

Kareem Ibraheem MD, Peter Rhee* MD, MPH, Asad Azim MD, Ahmed Hassan MD, Andrew Tang MD, Terence O'Keeffe* MD, Gary Vercruysse* MD, Narong Kulvatunyou* MD, Lynn Gries* MD, Bellal Joseph* MD, University of Arizona – Tucson

Invited Discussant: John Bini, MD

Introduction: Neck zones have been used to guide therapeutic management of penetrating neck trauma (PNT). The most recent management guidelines advocate computed tomography angiography (CTA) for any suspected vascular or aero-digestive injuries in all zones and give zone II injuries special consideration where operative intervention should be considered for symptomatic patients. We hypothesized that physical examination can safely guide CTA use in a "no-zone" approach.

Methods: 8-year retrospective analysis of adult patients with PNT at our Level I trauma center was performed. We included all patients in whom the platysma was violated. Patients were classified into three groups; hard signs, soft signs, and asymptomatic. CTA use and positive CTA (contrast extravasation, dissection, or intimal flap) and missed injuries were reported. Our outcomes were need for operative intervention and therapeutic neck exploration (defined by repair of major vascular or aero-digestive injuries).

Results: A total of 337 patients with PNT met the inclusion criteria of platysma violation. 82 patients had hard signs, 156 had soft signs, and 99 were asymptomatic. The vast majority of patients (80/82) with hard signs went to the OR. In patients with soft signs (n=156), CTA was performed in 84% (131/156); 20% (11/131) had a positive CTA and 0.8 % (1/131) had therapeutic neck exploration. A total of 26% (40/156) patients with soft signs went to the OR for full neck exploration and 35% (14/40) had therapeutic neck exploration. Only 8.4% of patients with soft signs in zone II required therapeutic neck exploration. The rate of therapeutic neck exploration was not significantly different (p=0.59) among the 3 neck zones. In the asymptomatic group (n=99), 80% (79/99) of patients had CTA and none required therapeutic neck exploration. Regardless of the zone of injury, in asymptomatic patients there was no therapeutic neck exploration even with a positive CTA **(Table).** There were higher rates of negative exploration (65%) and unnecessary CTA (80%) in the soft signs and asymptomatic groups, respectively. There were no missed or delayed injuries identified.

Conclusion: Physical examination, not the zone of injury, should be the primary guide to CTA use in patients with penetrating neck trauma. Asymptomatic patients do not require CTA and should be managed with observation regardless of the zone of injury. Zone-based algorithms result in unnecessary negative explorations in patients with soft signs and may need revisions.

Patients without hard signs (soft and asymptomatic)	Variable (n)	Therapeutic neck exploration % (n)
Zone 1 (n=49)	Soft signs (27)	14.8% (4)
	Asymptomatic (22)	0%
	Positive CTA (1/43)*	0%
Zone 2 (n=140)	Soft signs (83)	8.4% (7)
	Asymptomatic (57)	0%
	Positive CTA (9/105)*	0%
Zone 3 (n=55)	Soft signs (36)	8.3% (3)
	Asymptomatic (19)	0%
	Positive CTA (5/51)*	20.0% (1)

* Positive CTA to total CTA

NOTES

Session: XII: Quickshot Session I
Paper QS4: 8:18 - 2:24 AM

The Cardiovascular Effects of Rapid Sequence Intubation: Reconsidering the A, B, Cs of Trauma Resuscitation

Paula Ferrada* MD, Luke Wofe BS, Rahul J. Anand MD, Seda Bourikian BS, Caitlin Francoisse BS, Stephanie Goldberg MD, James Whelan MD, Beth Broering RN, Sudha Jayaraman MD, Michel Aboutanos* MD, Virginia Commonwealth University

Invited Discussant: Herbert Phelan, III, MD

Background: Evidence supporting the traditional Airway, Breathing, Circulation (ABC) approach to trauma care is based on expert consensus, with little data to support the order of the factors. Furthermore, this sequence has been challenged in the management of medical cardiac arrest, advocating instead for circulation first. The objective of this study is to retrospectively evaluate the cardiovascular effects of Rapid Sequence Intubation (RSI) while obtaining the airway during the ABC sequence in hypotensive trauma patients.

Methods: Institutional Review Board approval was obtained to retrospectively evaluate the charts of patients that arrived to a level one trauma center, not intubated in route, and with hypotension on arrival defined by systolic blood pressure (SBP) of 90mmHg or less. The study period was January 1 of 2014 to December 31 of 2015. Variables examined included SBP before and after RSI, ISS, blood transfusion timing in relation to RSI and mortality.

Results: During the study period 229 patients were deemed hypotensive upon arrival to our center. Of those 133 were not intubated in the trauma bay, 22 patients arrived with no measurable blood pressure and 8 patients did not have a second SBP measurement immediately after RSI. 66 hypotensive patients underwent intubation and had SBP measured immediately prior and after RSI. The majority of the patients were male (76%), the mechanism of injury was penetrating trauma in 36%. RSI resulted in major cardiovascular effects with 75% of the already hypotensive patients dropping the SBP further (Mean:-18 mmHg, Median: -15 mmHg). Within this group, 35 (53%) were non-survivors (D) and 31 (45%) survived (A). The non-survivors had a significantly higher ISS compared with survivors (D-ISS: Median 30, Mean 33.8 vs A-ISS: Median 17, Mean 22.5, $p< 0.05$). Both groups had a drop in SBP during RSI which was not statistically different, though higher in the non-survivors (D-SBP drop: Mean 21.8 mmHg vs A-SBP drop: Mean 13.1 mmHg, $p= 0.25$). Strikingly, patients who underwent RSI prior to blood transfusion had a significantly higher mortality rate than those who had blood transfusion initiated first (50% vs 78% $p< 0.05$).

Conclusions: In this retrospective review RSI resulted in a further drop in SBP in hypotensive trauma patients. Mortality rate was higher when RSI was performed before blood transfusion was initiated. Further studies are required to consider the initiation of blood transfusion first in hypotensive patients who are maintaining the airway.

NOTES

Session: XII: Quickshot Session I
Paper QS5: 8:24 - 8:30 AM

PROSPECTIVE EVALUATION OF ADMISSION CORTISOL IN TRAUMA

Amy M. Kwok MD, MPH, James W. Davis* MD, Rachel C. Dirks Ph.D., Krista L. Kaups* MD, UCSF Fresno
Invited Discussant: Luke Leenen, MD, PhD

Introduction:
Adrenal insufficiency (AI) has been shown to occur soon after trauma and is associated with increased mortality. Prior studies involving patients in the immediate post-trauma period have been essentially limited to patients with hemorrhagic shock. The purpose of this study was to investigate the impact of acute adrenal insufficiency in all critically ill trauma patients. We hypothesized that critically ill trauma patients with severe adrenal insufficiency would be at higher risk for requiring vasopressors, have a greater need for blood product administration, and have a higher mortality rate.

Methods:
A blinded, prospective, observational study was performed at an ACS verified Level I trauma center including all patients with highest level trauma team activations, from 12/1/14-1/31/16, who were admitted to the ICU. Exclusion criteria were age <18, transfer from another hospital, previous steroid use, etomidate administration, brain death or comfort care within 24 hours of admission, or insufficient quantity of blood available for testing. Serum cortisol levels were measured from the initial blood draw in the trauma bay. Patients were categorized according to cortisol ≤ 15 µg/dL (severe), 15.01-25 µg/dL (moderate), or > 25 µg/dL (normal) and compared on demographics, injury severity score (ISS), initial vital signs, blood products usage, pressor requirements, steroids given for AI, and mortality. Groups were compared with Chi square and Mann Whitney U tests with significance attributed to a p value < 0.05.

Results:
During the study period, 340 patients with highest level trauma activations were admitted to the ICU; 187 were excluded and 153 patients were included in analysis. Patients were activated for hypotension (n=42), decreased GCS (n=82), mechanism (n= 16), and other (n=13). Patients were severely injured with a mean ISS of 24; overall mortality was 14%. Mechanism of injury was blunt in 126 patients (82%) and penetrating in 27 patients (18%). Demographics were similar among the groups. Mean admission cortisol level was 24 ± 10 ug/dl.

Initial cortisol	N	ISS	Blood products (1st 24h)	Pressor (24h)	Pressor (24-72h)	Mortality
≤ 15 µg/dL	18	28 [22-37]	8 [1-28]	8 (42%)	9 (47%)	7 (39%)
15.01-25 µg/dL	67	25 [21-33]	3 [0-6]	6 (9%)*	17 (25%)	11 (16%)*
> 25 µg/dL	68	22[14-27]*	0 [0-3]	5 (7%)*	8 (11%)*	4 (6%)*

*p < 0.05 compared to cortisol ≤ 15 µg/dL

Conclusion:
Patients with moderate to severe adrenal insufficiency on admission required more blood products, were more likely to require pressors within 24 hours of arrival, and had a higher mortality rate than patients with normal admission cortisol levels. We recommend obtaining an admission cortisol level as part of the trauma panel in order to help identify these high risk patients.

NOTES

Session: XII: Quickshot Session I
Paper QS6: 8:30 - 8:36 AM

NONOPERATIVELY MANAGED BLUNT SPLENIC TRAUMA IS ASSOCIATED WITH HIGHER INCIDENCE OF VENOUS THROMBOEMBOLISM

Charles A. Karcutskie MD, MA, Jonathan P. Meizoso MD, Juliet J. Ray MD, Davis Horkan MD, Xiomara D. Ruiz MD, Gerardo A. Guarch MD, Krishnamurti Rao MD,MPH, Laura Teisch BS, Michael Paonessa BS, Carl I. Schulman* MD, Ph.D., MSPH, FACS, Nicholas Namias* MBA,MD, FACS, FCCM, Kenneth G. Proctor* Ph.D., University of Miami

Invited Discussant: Jordan Weinberg, MD

Introduction: Previous studies have linked hypercoagulability and increased risk of venous thromboembolism (VTE) to thrombocytosis after splenectomy. Despite increases in nonoperative management, there are no data investigating the influence of various solid organ injuries on VTE incidence in this group. We hypothesize that nonoperatively managed blunt injury to the spleen, compared to the liver, will have higher rates of VTE.
Methods: A retrospective review of 1016 adult patients with blunt trauma and abdominal solid organ injury admitted to the intensive care unit (ICU) from 01/2010-01/2016 was performed. Patients with isolated liver injury were compared to those with isolated spleen injury, with a subgroup analysis in patients managed nonoperatively. Parametric data is presented as mean ± standard deviation and nonparametric as median (interquartile range). Significance was considered at $p \leq 0.05$.
Results: Patients with isolated liver injury (n=101) had a VTE rate of 7.9%, while those with isolated spleen injury (n=88) had a significantly higher VTE rate of 17.0% (p=0.045). Groups were similar in age, gender, heart rate, systolic blood pressure, Glasgow Coma Scale score, base deficit, hematocrit, platelet counts, injury severity score, Greenfield Risk Assessment Profile score, hospital length of stay (LOS), ICU LOS, and delayed prophylaxis (>48h) (all p>0.05). Additionally, no difference was found in transfusion requirements, pelvic or leg fractures, or OR time (all p>0.2). When assessing nonoperatively managed patients with isolated liver (n=86) vs. isolated spleen injury (n=71), groups remained similar in all categories (all p>0.8), however, VTE incidence was significantly higher in isolated spleen injury (9.9% vs. 2.3%, p=0.043). (Table 1) Additionally, all pulmonary emboli (n=5) occurred in patients with isolated spleen injury (p=0.012).
Conclusion: Differences in VTE incidence in blunt trauma patients, both overall and when nonoperatively managed, may be associated with the organ of injury. Isolated splenic trauma, managed operatively or nonoperatively, appears to be prothrombotic compared to liver trauma.

Table 1. Nonoperatively Managed Solid Organ Injury

	Isolated Liver Injury n=86	Isolated Spleen Injury n=71	p-value
Age, years	40 ± 18	40 ± 18	0.828
Male gender, % (n)	59.3% (51)	71.8% (51)	0.101
Heart Rate, bpm	95 ± 20	94 ± 27	0.745
Systolic Blood Pressure, mmHg	129 ± 28	134 ± 25	0.294
Glasgow Coma Scale Score	13 ± 4	13 ± 4	0.945
Base Deficit	-2 ± 3	-2 ± 4	0.257
Hematocrit	39 ± 6	40 ± 7	0.966
Platelet Count, Admission	267 ± 81	264 ± 103	0.826
Platelet Count, Lowest	144 ± 60	155 ± 63	0.383
Platelet Count, Highest	457 ± 227	434 ± 244	0.554
Injury Severity Score	26 ± 11	23 ± 10	0.089
Greenfield Risk Assessment Profile Score	8 ± 4	8 ± 4	0.654
Length of Stay, days	12 (6-19)	9 (6-21)	0.765
ICU Length of Stay, days	4 (2-11)	4 (3-7)	0.827
Delayed Prophylaxis (>48h), % (n)	20.0% (11)	14.3% (7)	0.442
Venous Thromboembolism, % (n)	2.3% (2)	9.9% (7)	0.043*
Deep Venous Thrombosis, % (n)	2.3% (2)	2.8% (2)	0.845
Pulmonary Embolism, % (n)	0% (0)	7.0% (5)	0.012*

NOTES

Session: XII: Quickshot Session I
Paper QS7: 8:36 - 8:42 AM

ANGIOEMBOLIZATION IN THE MANAGEMENT OF ISOLATED SPLENIC INJURIES: IS THERE REALLY A RELATIONSHIP BETWEEN EMBOLIZATION AND SPLENIC SALVAGE?

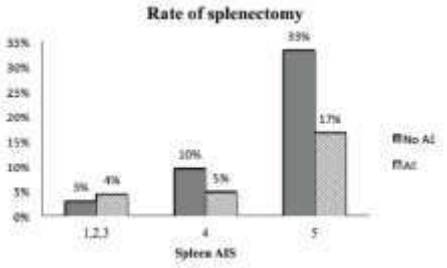
Graeme M. Rosenberg MD, Thomas G. Weiser* MD, Timothy Browder* MD, Paul Maggio* MBA,MD, Lakshika Tennakoon David A. Spain* MD, Kristan L. Staudenmayer* MD, Stanford University

Invited Discussant: Indermeet Bhullar, MD

Introduction: There is variability in the use of angioembolization (AE) for splenic injuries at U.S. trauma centers. Recent data suggest improved splenic salvage rates when AE is employed for high-grade injuries; however, protocols and salvage rates vary among centers. Our center has a low rate of AE with an observed high rate of splenic salvage. We hypothesized that splenectomy rates will not be significantly different between institutions that frequently employ AE versus institutions that do not.

Methods: Data for this study was obtained using the National Trauma Data Bank (NTDB, 2014). Patients were included if they had ICD-9-CM codes for splenic injury and were ≥18yrs old. Patients were excluded if they died in the ED and if they went from the ED to the OR for splenectomy. Only patients with isolated splenic injuries were analyzed. Descriptive measures including age, gender, race, ISS, splenic AIS score, hospital teaching status, and trauma center designation (I-V) were included. Trauma centers were grouped into quartiles based on frequency of AE in isolated splenic injuries. Unadjusted analyses and logistical regression analyses were performed. Models were created controlling for center effect and using the quartile of AE as an independent variable.

Results: There were a total of 2,762 isolated splenic injuries in adult trauma patients in 2014. After exclusion criteria, there were 1,895 patients at 358 centers. Of these patients, 313 (16.5%) underwent AE and 124 (6.5%) had a splenectomy. Overall, splenectomy rates were not different for AE (19/294, 6%) vs. no AE (105/1477, 7%, p NS). However, splenectomy rates were lower for high-grade injuries when AE was used vs. not (AE vs. no AE - AIS 4: 5% vs. 10%; AIS 5: 17% vs. 33%; Figure). Quartiles for AE use were created to analyze the association between centers' AE practices and splenectomy rates. Mean center AE rates in the lowest vs. highest quartiles were 1.9% and 31.7%, respectively. Splenectomy rates were lower in centers with high AE use vs. those with low AE use (4.4% vs. 8.5% in the highest vs. lowest quartiles, p=0.004). The impact of quartiles of AE rate remained significant in regression analysis when controlling for age, gender, race, spleen AIS, mechanism of injury, and type of center (OR 0.77, p = 0.001). Findings were robust in all regression models employed.



Conclusion: Contrary to our hypothesis, AE use was associated with reduced splenectomy rates in isolated splenic injuries. Our analysis is agnostic to the rationale for AE, suggesting that overall aggressive use of AE is associated with reduced splenectomy rates regardless of any specific protocol. These findings suggest that AE may increase the rate of splenic salvage in isolated splenic injuries. Future investigation should be directed towards identifying the correct patient population for which the rate of AE use as a means to improve splenic salvage is sufficiently high enough to outweigh any added cost and risk of the procedure.

NOTES

Session: XII: Quickshot Session I
Paper QS8: 8:42 - 8:48 AM

THE MANGLED EXTREMITY SCORE AND AMPUTATION: TIME FOR A REVISION

Melissa N. Loja MD, MAS, Joseph DuBose* MD, Amanda Sammann MD,MPH, Chin-Shang Li Ph.D., Yu Liu MS, Stephanie Savage* MD, MS, Thomas Scalea* MD, John B. Holcomb* MD, Todd E. Rasmussen* MD, M M. Knudson* MD, AAST PROOVIT Study Group * University of California, Davis

Invited Discussant: Jon Perlstein, MD

Background: The Mangled Extremity Severity Score (MESS) was developed 25 years ago in an attempt to utilize the extent of skeletal and soft tissue injury, limb ischemia, shock, and age to predict the need for amputation after extremity injury. Subsequently, there have been mixed reviews as to the utility of this score, especially when considering the technological advances in diagnostic and treatment modalities that have occurred over the past two decades. We hypothesized that the MESS, when applied to a data set collected prospectively in modern times, would not correlate with the need for amputation.
Methods: We applied the MESS score to patient data collected in the American Association for the Surgery of Trauma PROspective Vascular Injury Treatment (PROOVIT) registry. This registry contains demographic, diagnostic, treatment, and outcome data on patients admitted to one of 14 Level 1 trauma centers, collected
prospectively.
Results: Between February 2013 and August 2015, 230 patients with lower extremity arterial injuries were entered into the PROOVIT registry. The majority were male with a mean age of 34 years (range 4-92) and a blunt mechanism of injury at a rate of 47.3%. Isolated femoral injuries were found in 44.3% of cases, popliteal in 26%, with the remaining occurring in below-knee arteries or multiple locations. 9.1% required immediate amputation for damage control. A MESS of 8 or greater was associated with higher transfusion rates (9.2 units vs 6.4, p=0.03) and a longer stay in the ICU (10.5 days vs 5.5, p=0.005). 81.3% of limbs were ultimately salvaged (mean MESS 4.29)
and 17.7% required primary or secondary amputation (mean MESS 6.58. p<0.001). However, after controlling for confounding variables including mechanism of injury, degree of arterial injury, and concomitant venous and orthopedic injuries, the MESS between salvaged and amputated limbs was no longer significantly different
(TABLE). Importantly, a MESS of 8 predicted amputation in only 32.7% of patients.
Conclusion: Therapeutic advances in the treatment of vascular, orthopedic, neurologic and soft tissue injuries have reduced the diagnostic accuracy of the MESS in predicting the need for amputation. There remains a significant need to examine additional predictors of amputation following severe extremity injury.

Table:

MESS Elements	Amputations Mean score (n = 43)	Not amputated Mean score (n = 187)	p-value unadjusted	p-value adjusted*
Skeletal/soft tissue score	2.58	1.71	<0.0001	0.5439
Limb ischemia	1.93	1.16	<0.0001	0.5560
Shock	0.51	0.32	0.20	0.5150
Age score	0.86	0.66	0.22	0.2272
Total MESS	6.58	4.29	<0.0001	0.2643

*Adjusted for significant confounders including mechanism, arterial transection, concomitant nerve and orthopedic injuries

NOTES

Session: XII: Quickshot Session I
Paper QS9: 8:48 - 8:54 AM

BEYOND THE PROPPR RATIO: TRANSFUSING YOUNG BLOOD IMPROVES CLINICAL OUTCOMES IN SEVERELY INJURED TRAUMA PATIENTS

John Yonge MD, Christopher Connelly MD, Terence O'Keeffe* MB ChB, Mitchell Cohen* MD, Kenji Inaba* MD, Charles Wade* Ph.D., Jeffrey Kerby* MD, Ph.D., Bryan Cotton* MD, MPH, John Holcomb* MD, Martin Schreiber* MD, The PROPPR Study Group, Oregon Health & Sciences University

Invited Discussant: Louis Magnotti, MD

Introduction: Outcomes following the transfusion of older blood in severely injured trauma patients are not well described. Standardized methods to analyze the age of blood and the influence of multiple transfusions are lacking. The purpose of this study was to determine the impact of young versus old red blood cell (RBC) transfusions in severely injured trauma patients. We hypothesized that transfusing RBCs < 14 days old would improve clinical outcomes in severely injured trauma patients.

Methods: Prospectively collected data from the Pragmatic Randomized Optimal Platelet and Plasma Ratio (PROPPR) trial were analyzed. We compared patients receiving young RBCs (mean age <14 days) to patients receiving old RBCs (mean age ≥14 days). To evaluate the potential harm of receiving even a single unit of old RBCs, we compared patients receiving ≥ 3 units of exclusively young RBCs (age of each individual transfused unit <14 days) to patients receiving ≥3 units of exclusively old RBCs (age of each individual transfused unit ≥14 days). Linear and logistic regression models were generated for all study outcomes and accounted for age, injury severity score, and number of units transfused. To evaluate for survival bias, a subgroup analysis was completed on patients surviving the first 24 hours.

Results: 10,700 units of RBCs were transfused during the study period; 2,294 units were young RBCs (mean age 11 days) and 8,406 units were old RBCs (mean age 23 days). 465 units of exclusively young RBCs (mean age 9 days) and 2,455 units of exclusively old RBCs (mean age 27 days) were transfused. In the subgroup analysis, 1,862 units of young RBCs (mean age of 11 days) and 6,866 units of old RBCs (mean age 23 days) were transfused. 396 units of exclusively young RBCs (mean age 9 days) and 2,262 units of exclusively old RBCs (mean age 27 days) were transfused. The age of RBCs between PROPPR study groups (1:1:1 vs 1:1:2) was not statistically different. Patients transfused old RBCs had an increased risk of acute kidney injury (AKI) and all infectious complications excluding ventilator associated pneumonia and had fewer hospital-free days compared to patients transfused young RBCs (Table 1).

Conclusion: Transfusion of young RBCs in severely injured trauma patients is associated with increased hospital-free days and a reduced risk of both AKI and infectious complications. The associated risk reduction for AKI and infectious complications is stronger if patients receive exclusively young RBCs rather than a mean age of young RBCs.

Table 1: All patients	n	AKI OR [95% CI]*	p	Infection OR [95% CI]*	p	Hospital free days β coef** [95% CI]	p
Young RBCs	170	Reference	0.002	Reference	0.038	Reference	0.001
Old RBCs	508	2.2 [1.3-3.6]		1.5 [1.0-2.3]		-2.3 [(-) 3.6-1.0]	
Exclusively young RBCs	46	Reference	0.012	Reference	0.041		
Exclusively old RBCs	188	5.1 [1.4-18.2]		2.7 [1.0-6.9]			
Subgroup Analysis		**AKI OR [95% CI]***	**p**	**Infection OR [95% CI]***	**p**	**Hospital free days β coef** [95% CI]**	**p**
Young RBCs	146	Reference	0.005	Reference	0.036	Reference	0.002
Old RBCs	432	2.1 [1.3-3.6]		1.6 [1.0-2.4]		-2.2 [(-) 3.6-0.8]	
Exclusively young RBCs	40	Reference	0.016	Reference	0.042		
Exclusively old RBCs	167	4.9 [1.3-17.8]		2.7 [1.0-7.2]			

*Odds ratios calculated with logistic regression, AKI: acute kidney injury, OR: Odds ratio, CI: confidence interval;
**β coefficient calculated with linear regression

NOTES

Session: XII: Quickshot Session I
Paper QS10: 8:54 - 9:00 AM

Acute vascular interventional radiology techniques in acute care medicine and surgery performed by trained acute care physicians.

Junya Tsurukiri MD, Ph.D., Shiro Mishima MD, Ph.D., Jun Oda* MD, Ph.D., Tetsuo Yukioka* MD, Ph.D., Tokyo Medical University

Invited Discussant: A. Peter Ekeh, MD

Introduction: Comprehensive treatment of a patient in the field of acute-care medicine and surgery (AMS) includes surgical techniques as well as several other treatment modalities. Since acute vascular interventional radiology techniques (AVIRT) have become increasingly popular, adequately training in-house physicians in this field can further improve the quality of on-site care delivered.

Methods: After obtaining approval from the institutional ethics committee, a retrospective study of daily referrals and AVIRT procedures performed over a period of 1 year by acute care physicians trained in AMS, including those conducted out of hours, was carried out. The trained physicians with Japanese Association of Acute Medicine's Board certification had completed at least 1 year of training as a member of the endovascular team in the radiology department of another university hospital. This study was designed in such a way that at any given time, at least one of the physicians was available to come to the hospital within 1 h and perform AVIRT. Femoral sheath insertion was performed by the resident physicians under the guidance of the trained physicians.

Results: This study comprised 77 endovascular procedures for therapeutic AVIRT (trauma, n = 29; non-trauma, n = 48) conducted over the past 1 year. (Table) AVIRT was performed in 62 patients with a mean age of 64 years (range: 9–88 years), of which 55% were male. Furthermore, 47% of the procedures performed were out-of-hours referrals (trauma = 52%, non-trauma = 44%). Three patients underwent resuscitative endovascular balloon occlusion of the aorta in the emergency room. AVIRT procedures were performed using 8-9 Fr. guiding catheters with 8-9 Fr. femoral artery sheath in stroke patients and 5 Fr. catheters with 5 Fr. sheath in patients with pelvic injuries. In other cases, 4 Fr. guiding sheath catheters, or 6 Fr. catheters with 6 Fr. femoral artery sheath were used. Treatment materials included detachable microcoils, gelfoam, polyvinyl alcohol particles, and N-butyl-2-cyanoacrylate. No major device-related complications were encountered. The overall mortality rate within 60 days was 8%, and the causes of death included exsanguination (n = 2), pneumonia (n = 2), sepsis (n = 1), and brain death (n = 1).

Conclusion: AVIRT performed by trained acute care physicians appears to be significantly advantageous for acute on-site care because it has a good technical success. Therefore, a standard training program for acute care physicians or trauma surgeons should be established to make these techniques a part of the universally accepted regimen.

Trauma (n = 29)		*Non-trauma (n = 48)*	
Embolization (coil, gelfoam, or NBCA)		**Embolization (coil, gelfoam, PVA, or NBCA)**	
Abdomen		Gastrointestinal bleeding	13
Renal injury	9	Hemoptysis	4
Splenic injury	8	Retroperitoneal hemorrhage	3
Hepatic injury	1	Hemothorax (wound/thoracic artery aneurysm)	2
Pelvis		Hemoperitoneum	1
Pelvic injury	5	Peritoneal hemorrhage	
Chest		Hepatic cell carcinoma	2
Mediastinal artery (subpar)	1	Pelvic sarcoma	1
Post-operative bleeding		Mediastinal hemorrhage	1
Retroperitoneal hemorrhage (vascular suspect)	2	Atonic postpartum hemorrhage	1
Delayed bleeding		**Mechanical retrieval and revascularization**	
Kidney / Spleen	1	Stroke (cerebral infarction)	11
Head trauma		**Others (angioplasty or drug injection)**	
Epidural hematoma	2	Radial artery embolus	1
Vertebral artery dissection	2	Superior mesenteric artery occlusion	1
Carotid cavernous fistula	1	Internal iliac artery pseudoaneurysm	1
Chronic subdural hematoma	1	Iliac artery stenosis	1

NBCA, N-butyl-2-cyanoacrylate; coil/PVA, polyvinyl alcohol particles

NOTES

Session: XII: Quickshot Session I
Paper QS11: 9:00 - 9:06 AM

EARLY FLUID OVERRESUSCITATION PATTERNS IN SEVERE PEDIATRIC BURN INJURIES AND INFLUENCE ON OUTCOMES

Lindsay J. Talbot MD, Renata Fabia MD, Ph.D., Jonathan Groner* MD, Rajan Thakkar MD, Brian Kenney MD, MPH, Nationwide Children's

Invited Discussant: Tina Palmieri, MD

Introduction:
Overresuscitation after severe burn is thought to predispose to complications such as extremity compartment syndrome and pulmonary edema. Formulas predicting resuscitation volume are variably useful depending on individual application. We investigated the rate of overresuscitation in a cohort of burn patients and the association between overresuscitation and late surgical and overall complications.
Methods:
Institutional IRB approval was obtained. A retrospective review was performed (2009 - 2015) of a single-institution prospectively-maintained burn registry. Patients less than18 years of age admitted with total body surface area (TBSA) thermal injury greater than 15% were included. Exclusion criteria included age > 18 years, death within 72 hours of admission, completion of first 8 hours after injury at an outside institution, and concomitant non-burn traumatic injuries. Total fluid resuscitation in the first 8 hours after burn was determined and compared to optimal resuscitation as predicted by the modified Parkland formula. Outcomes were compared based on percent deviation from predicted Parkland needs stratified by receipt of < 25%, 25 – 50%, 50 – 100%, 100 – 200%, and > 200% predicted fluid needs. All parametric data were examined using Student's t-test and non-parametric data were analyzed using Chi-squared testing. Multivariate analysis based on a priori hypotheses was performed for all outcomes in question.
Results:
Fifty patients met inclusion criteria. Median age was 4 years (IQR 2.0 – 11.5 years), and 75% were male. Median TBSA was 21.2% (IQR 16 – 32.5%). 60% of patients received initial care at outside institutions, and patients received a median of 12.8% of their initial resuscitation volume prior to referral center arrival (IQR 0 – 41.1%). Patients received on average 110% higher fluid volume (SD 120%) than the need predicted by the modified Parkland formula in the first 8 hours after injury. 19 (38%) patients underwent escharotomy or late intubation, defined as intubation after the initial ED presentation. 13 (26%) required escharotomy and 10 (20%) required late intubation. In multivariate analysis adjusting for TBSA, patient weight, and ED disposition (ICU versus routine ward), overresuscitation did not increase risk of escharotomy and was not an independent predictor of length of stay or duration of mechanical ventilation. However, overresuscitation was an independent predictor of longer ICU stay ($p = 0.03$), and was associated with a higher risk of unplanned reintubation after initial emergency room evaluation (OR 2.0, CI 0.93 – 4.2, $p = 0.08$).
Conclusions:
In a single institution experience, burn patients were consistently overresuscitated in the first eight hours after injury. Overresuscitation is associated with risk of late intubation and is an independent predictor of duration of ICU admission. Careful attention to very early fluid resuscitation, although difficult due to the interplay between prehospital personnel, referring hospitals, and burn centers, is critical to appropriate early fluid aministration in severely burned patients.

NOTES

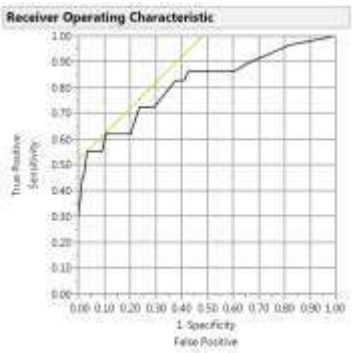
Session: XII: Quickshot Session I
Paper QS12: 9:06 - 9:12 AM

IMPROVED PREDICTION OF HIT IN THE SICU USING A SIMPLIFED MODEL OF THE WARKENTIN 4-T SYSTEM: 3-T

Matthew B. Bloom* MD, Oksana Volod MD, Jeffery Johnson MD, Terris White MD, Eric J. Ley* MD, Rodrigo F. Alban* MD, Daniel R. Margulies* MD, Cedars-Sinai Medical Center

Invited Discussant: Steven Johnson, MD

Introduction: The Warkentin 4-T scoring system for determining the pre-test probability of heparin-induced thrombocytopenia (HIT) has been shown not to be accurate in the ICU, and does not take into account body mass index (BMI), previously described as an associated factor. Our objective was to create an improved scoring system with the inclusion of BMI and platelet factors most relevant to ICU patients.
Methods: Prospectively collected data on patients in the surgical and cardiac ICU between January 2007 and February 2016 presumed to have HIT by clinical suspicion were reviewed. Patients were categorized into 3 BMI groups as normal weight (18.5-24.9), overweight (25-29.9), obese (≥30). Demographic and clinical data including Warkentin 4-T scores and its sub-scores, Serotonin Release Assay (SRA), and thromboembolic diseases were recorded. HIT positive patients were defined as having SRA>20%. 2-sided Cochran-Armitage Trend Test was used to confirm an ordered association between heavier BMI groups and increasing incidence of HIT. Multivariate analyses were used to identify independent predictors of HIT. Increasingly large BMI groups were awarded 0, 1 or 2 points, similar to the Warkentin scoring system. Receiver operating characteristic (ROC) curves were analyzed to compare accuracy of multiple predictive models.
Results: A total of 523 patients met inclusion criteria. Mean age was 60.2 ± 15.8 years, 59% were male, and mean BMI was 27 ± 6.2 kg/m2. 49 (9%) patients were positive for HIT. Incidence of HIT increased progressively with BMI [6.6%, 7.8%, 15.3%; P = 0.0081]. On univariate analysis, only BMI, 4T(Timing) P<0.001; 4T(oTher) P<0.001; and the total 4T score P<0.001 were associated with HIT. In multivariate analysis, BMI [aOR = 4.19, 95% CI = 1.48-12.9, P = 0.025]; 4T(Timing) [aOR = 2.37, 95% CI = 1.26-4.53, P = 0.007]; and 4T(oTher) [aOR = 3.96, 95% CI = 1.09-8.90, P < 0.001], were independently associated with HIT. ROC curves were compared between 4-T model (AUC =0.768) and models with BMI and components of the 4-T model. A model with BMI, 4T(Timing), and 4T(oTher) had significantly improved receiver characteristics (AUC = 0.841), and was better than a model which included the entire 4-T scoring system with BMI (AUC = 0.791).



Conclusion: Including patient 'T'hickness into a pre-test probability model along with platelet 'T'iming and the exclusion of o'T'her causes of thrombocytopenia yields a simplified '3-T' scoring system that has increased predictive accuracy in the ICU. Additional biochemical work is indicated to further decipher the role of obesity in this immune-mediated condition.

NOTES

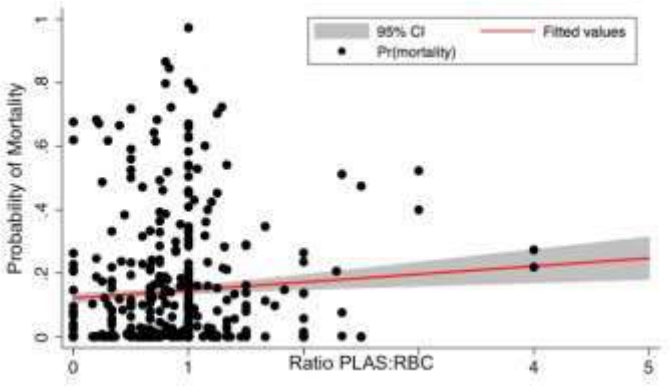
Session: XII: Quickshot Session I
Paper QS13: 9:12 - 9:18 AM

HIGH RATIO PLASMA RESUSCITATION DOES NOT IMPROVE SURVIVAL IN PEDIATRIC TRAUMA PATIENTS

Jeremy W. Cannon* MD, SM, Matthew A. Borgman MD, Robert C. Caskey MD, Michael A. Johnson MD, Lucas P. Neff MD, University of Pennsylvania

Invited Discussant: David Notrica, MD

Introduction: Damage control resuscitation including balanced resuscitation with high ratios of plasma (PLAS) and platelets (PLT) to red blood cells (RBC) improves survival in adult patients. We hypothesize that a high ratio PLAS to RBC resuscitation strategy similarly improves mortality in severely injured pediatric patients.
Methods: The Department of Defense Trauma Registry (DoDTR) was queried from 2001-2013 for pediatric trauma patients (<18 years). Burns, drowning, isolated head trauma, and missing injury severity score (ISS) were excluded. Of the remaining patients, those receiving a massive transfusion (MT) were evaluated. MT patients were defined as receiving ≥40 mL/kg total blood products in 24 hours. Mortality at 24 hours and in-hospital was evaluated for increasing PLAS to RBC ratios. Secondary outcomes included blood product utilization over 24 hours, ventilator days, and ICU and hospital length of stay (LOS).
Results: The DoDTR yielded 4,990 combat-injured pediatric trauma patients of whom 435 met inclusion criteria. Analysis of PLAS to RBC ratios across the entire spectrum of possible ratios in these patients demonstrated no clear inflection point where mortality was improved (Figure). Using a division between high (HI) and low (LO) ratio PLAS:RBC of 1:2, there was no difference in all-cause mortality at 24 hours (HI 6.1% vs. LO 2.7%, p=0.26) and hospital mortality (HI 14.9% vs. LO 15.1%, p=0.97). Cox regression analysis also demonstrated no mortality benefit to a HI ratio strategy (OR 1.17, 95% CI, 0.53-2.58, p=0.69). HI ratio patients received less RBC but more PLAS and PLT and more total blood products. Those in the HI ratio group also had more ventilator days (HI 4.1 vs. LO 2.3, p<0.01) and a longer ICU LOS (HI 6.1 vs. LO 4.0, p=0.02).
Conclusion: In combat-injured children undergoing a MT, a high ratio of PLAS to RBC does not appear to improve survival. Further prospective studies should be performed to determine the optimal resuscitation strategy in critically injured pediatric patients.



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SESSION XIII:

QUICKSHOTS II

SATURDAY, SEPTEMBER 17, 2015, 9:35AM – 11:00 AM

GRAND BALLROOM

MODERATOR: MICHAEL SISE, M.D.

Session: XIII: Quickshot Session II
Paper QS14: 9:36 - 9:42 AM

ADMISSION N-TERMINAL PRO-BRAIN NATRIURETIC PEPTIDE CONCENTRATIONS PREDICT DEVELOPMENT OF ATRIAL FIBRILLATION IN GENERAL SURGICAL INTENSIVE CARE UNIT PATIENTS

Nalin Chokengarmwong MD, Nalin Chokengarmwong MD, Kent Lewandrowski MD, Yuchiao Chang Ph.D., James L. Januzzi MD, Luis A. Ortiz BS, Elizabeth Lee-Lewandrowski MPH, Ph.D., Haytham Kaafrani MD, MPH, Peter Fagenholz MD, David R. King* MD, Marc Demoya* MD, Kathryn Butler MD, Jarone Lee MD, MPH, George Velmahos* MD, Ph.D., Daniel D. Yeh* MD, Massachusetts General Hospital

Invited Discussant: Kevin Schuster, MD, MPH

Introduction: New onset atrial fibrillation (AF) in critically ill patients is associated with significant morbidity, prolonged hospitalization, and increased mortality. N-terminal pro-B type natriuretic peptide (NT-proBNP) is released by the cardiomyocytes in response to stress and may predict development of AF after cardiac, vascular, and thoracic surgery. We hypothesized that NT-proBNP level at the time of admission to the surgical ICU would help predict the development of AF in a general surgical and trauma population.

Methods: From July to October 2015, NT-proBNP concentrations were measured at the time of ICU admission. Abnormal NT-proBNP concentrations were based on currently accepted age-adjusted cut-offs. We examined the relationship between the development of AF and demographic (age, gender) and clinical variables (reason for admission, APACHE II score, Charlson Comorbidity Index, history of AF, coronary artery disease, coronary artery bypass graft surgery, valve surgery, thoracic surgery, medications, and fluid balance) using univariate analysis and a multivariable logistic regression model.

Results: 387 subjects were included in the cohort, none of whom were in AF at ICU admission. The mean age was 62 (±16) years and 40.3% were female. The risk of developing AF was higher for abnormal vs. normal NT-proBNP, 22% vs. 4%, respectively. Using optimal derived cutoffs (regardless of age), the risk of developing AF was 2% for NT-proBNP < 600 ng/L, 15% for NT-proBNP 600-2,000 ng/L, and 27% for NT-proBNP >2,000 ng/L. Multiple logistic regression analysis identified three predictors for new-onset AF: Age ≥ 70 (OR 3.7, 95% CI 1.5-9.3), history of AF (OR 25.3, 95% CI 9.6-67.0), and NT-proBNP ≥ 600 (OR 4.3, 95% CI 1.3-14.2). When none or only one predictor was present, AF incidence was <1%. When all three predictors were present, AF incidence was 66%.

Conclusion: NT-proBNP level at the time of admission to a general surgical ICU is predictive of the development of AF in the first 3 ICU days in patients in sinus rhythm at the time of ICU admission. Addition of NT-proBNP level to known risk factors can improve predictive power and identify patients who might potentially benefit from evidence-based prophylactic treatment for AF.

NOTES

Session: XIII: Quickshot Session II
Paper QS15: 9:42 - 9:48 AM

EARLY TRANEXAMIC ACID ADMINISTRATION AMELIORATES THE ENDOTHELIOPATHY OF TRAUMA AND SHOCK

Lawrence N. Diebel* MD, David M. Liberati MS Wayne State University

Invited Discussant: Grant O'Keefe, MD, MPH

Introduction: Systemic vascular endothelial injury is a consequence of trauma-hemorrhagic shock (T/HS) which results in disturbances of coagulation, inflammation and endothelial barrier integrity. Administration of tranexamic acid (TXA) in trauma patients is associated with a survival benefit and fewer complications if given early after injury. Mechanisms for this protective effect include the anti-fibrinolytic and anti-inflammatory effects of TXA. We hypothesized that "early" administration of TXA would abrogate vascular endothelial cell activation and injury following T/HS. This was studied *in vitro*.

Methods: Confluent human umbilical vein endothelial cells (HUVEC) were exposed to hydrogen peroxide (H2O2, 100μM) and/or epinephrine (epi, 10-3μM) to simulate post T/HS oxidant exposure and/or sympathoadrenal activation. TXA (150μM) was added 15, 60 or 120 minutes after H2O2 challenge. Markers of endothelial cell activation and/or injury studied included cell monolayer permeability, ICAM expression, syndecan release, tissue type plasminogen activator (tPA), plasmin activator inhibitor-1 (PAI-1) and angiopoietin 2 to angiopoietin 1 ratio (APO-2/APO-1). These biomarkers were measured 30 and 60 minutes after "early" TXA administration (15 minutes after H2O2/epi treatment) or "delayed" (at 60 or 120 minutes after H2O2/epi treatment).

Results: (mean ± SD; N = 4 for each group)

	Perm. (nmol/cm²/hr)	Syndecan (ng/ml)	tPA (pg/ml)	PAI-1 (pg/ml)	APO2/APO1 (pg/ml)	ICAM (MFI)
HUVEC alone	0.29±0.02	23.6±1.2	1515±34.1	5750±51.6	0.3±8.2	8.9±1.4
HUVEC + H_2O_2(15min)	0.60±0.05*	42.6±2.8*	3172±36.6*	5075±59.2*	2.0±6.68*	25.5±2.2*
HUVEC + epi	0.54±0.04*	41.8±2.2*	1600±43.2	5765±76.2	1.5±5.8*	24.2±2.6*
HUVEC + H_2O_2 + epi	0.78±0.06*	74.5±5.6*	2860±55.2*	5150±38.9*	2.5±4.8*	36.0±3.4*
HUVEC + H_2O_2 + epi +TXA(30)	0.34±0.03	28.9±1.4*	1605±50.1	5460±55.4*	0.3±7.9	9.9±1.8
HUVEC + H_2O_2 + epi +TXA(60)	0.35±0.03	29.6±1.2*	1570±41.8	5500±81.6*	0.4±5.6	10.2±3.1
HUVEC + H_2O_2+epi +TXA (1hr delay)	0.71±0.05*#	70.2±4.9*#	3550±74.1*#	5325±79.9*	2.0±7.3*#	34.8±2.4*#
HUVEC + H_2O_2+epi+TXA (2hr delay)	0.77±0.07*#	72.2±5.1*#	3280±66.5*#	5250±58.7*	2.3±6.2*#	35.7±3.9*#

*p<0.001 vs. HUVEC control, #p<0.001 vs. TXA (T=30 and 60)

Conclusion: Anti-fibrinolytic and other protective effects of TXA administration on endothelial activation/injury are time dependant. This study supports the concept that the clinical efficacy of TXA administration requires "early administration".

NOTES

Session: XIII: Quickshot Session II
Paper QS16: 9:48- 9:54 AM

ASPIRIN CHEMOPROPHYLAXIS DECREASES VENOUS THROMBOEMBOLISM IN 13,221 TRAUMA PATIENTS

Michelle H. Scerbo MD, Annamaria Macaluso MBA, MD, Matthew J. Pommerening MD, Jeffrey S. Tomasek MD, David K. Guervil PharmD, Charles E. Wade* Ph.D., Jessica C. Cardenas Ph.D., Bryan A. Cotton* MD, MPH, Charles C. Miller III, Ph.D., John B. Holcomb* MD, The University Of Texas Health Science Center At Houston

Invited Discussant: Raminder Nirula, MD, PhD

Introduction: Survivors of injury exhibit a multifactorial hypercoagulable state and have increased risk of venous thromboembolism (VTE). Despite ever earlier and aggressive chemoprophylaxis (CP) with various heparin compounds ("standard" CP; sCP), VTE rates have remained essentially unchanged. In high quality studies, aspirin has been shown to decrease VTE in postoperative patients. We hypothesized that inhibiting platelet function with aspirin as an adjunct to sCP would reduce the incidence of VTE in trauma patients.

Methods: Administrative and registry databases were queried to identify all adult patients admitted to a Level I Trauma center from January 2012 to June 2015. Patients that did not receive sCP or had a VTE present on admission (POA) were excluded. Exclusion criteria was not mutually exclusive. Continuous variables are presented as median (IQR); categorical variables are presented as proportions. Univariate analysis was conducted to compare demographic and injury data between patients receiving sCP or sCP plus aspirin (sCP+A). Cox proportional hazard models evaluated the potential aspirin benefit on symptomatic VTE incidence. The model included: dose of heparin or enoxaparin (prophylactic or therapeutic), major venous repair, central venous catheter, the Trauma Embolic Scoring System (TESS, includes age, ISS, obesity, lower-extremity fracture, ventilation > 3 days) and aspirin (81 or 325 mg/day). TESS is a previously validated score for assessing risk of VTE in trauma patients. Adjunctive use and dose of aspirin was at the discretion of the treating physician. Screening for VTE was not conducted.

Results: 13,221 patients were included in the study. 2,689 were excluded as they either had a VTE POA (40), or were discharged (2346) or died very early (316) prior to receiving sCP [discharge/death length of stay 1 (1, 2) days]. Median date of sCP initiation was day 1 (0.8, 2). 1886 patients received sCP+A by hospital day 3 (1, 6). 353 patients (3.4%) had a new symptomatic VTE on hospital day 5 (3, 10). While there was no difference in mechanism (89% blunt, p=0.4) between patients on sPA or sCP+A, patients on sCP+A had a higher TESS [4 (2, 5) vs. 4 (2, 6), p<0.001].
The Cox regression model revealed that aspirin administration was independently associated with a decreased relative hazard of VTE (hazard ratio, 0.75; 95% confidence interval 0.60-0.95; p=0.02). Absolute risk reduction was 1.8% and number needed to treat was 55 at 60 days post-injury. There were no increased bleeding or wound complications associated with sCP+A (point estimate 1.23, 95% CI 0.68-2.2, p=0.50).

Conclusion: In this large trauma cohort, adjunctive aspirin was independently associated with a significant reduction in VTE. There was no increase in bleeding complications associated with combining aspirin and standard chemoprophylaxis early after injury.

NOTES

Session: XIII: Quickshot Session II
Paper QS17: 9:54 - 10:00 AM

DEVELOPMENT OF A NOVEL COOLING TOURNIQUET TO MINIMIZE ISCHEMIC INJURY IN EXTREMITY TRAUMA

Shahram Aarabi MD, MPH, Xu Wang Ph.D., Alexander St. John MD, Esther Lim BS, Mark Trupiano BS, Ashley Emery Ph.D., Kaj Johansen MD, Ph.D., Niten Singh MD, Susan Stern MD, Nathan White MD, MS, Eileen Bulger* MD, Grant O'Keefe* MD, MPH, University of Washington

Invited Discussant: Warren Dorlac, MD

Introduction: Tourniquets are widely used in the care of extremity trauma. Therapeutic cooling is known to reduce ischemic injury in various tissues. We have (1) investigated the benefits of early cooling in an animal model of acute limb ischemia and, (2) used our data to build a device that cools injured extremities to minimize ischemic damage.
Methods: Acute hind limb ischemia was induced in swine (n=10) via aortic occlusion. One limb was externally cooled to 5-15°C and the uncooled contralateral limb served as a matched control. Serial limb venous blood gas measurements were obtained during 3 hours of ischemia followed by 2 hours of reperfusion. Continuous core body and limb temperatures were measured. Based on these data, we used COMSOL 4.4 computer heat transfer modeling of a human lower limb to determine the external cooling required to achieve core limb temperatures of 5-15°C. We then developed a cooling tourniquet device using Peltier solid-state cooling modules (TECs) and a counter-current circulating water system **(Figure 1)**. Finally, we tested the ability of our prototype to achieve our cooling goals in an metal cast model of a human lower limb.
Results: During ischemia, mean (SD) limb temperature was 15.9 (7.5)°C in the cooled limb versus 30.1 (2.1)°C in the control limb (ANOVA, p<0.001). Goal limb temperature was reached within 60 minutes of cooling **(Figure 2A)**. There were trends in mean venous pH, 7.30 (0.1) vs. 7.20 (0.1) (T-test p=0.09), and potassium, 4.8 (0.8) vs. 5.1 (1.1) mEq (T-test p=0.09), between cooled and uncooled limbs. Venous lactate was significantly decreased during ischemia in the cooled limb, 4.4 (2.3) mmol/L, compared to the uncooled limb, 5.6 (3.4) mmol/L (T-test p=0.045) **(Figure 2B)**. COMSOL simulations demonstrated that heat removal of 150 watts is required to cool a human lower limb to 5-15°C within 30 minutes and that this could be achieved with our configuration of TECs and heat sink. Lastly, experiments on our model human lower limb showed that our prototype was able to achieve cooling to 5-15°C within 30 minutes.
Conclusion: Our data show that cooling to 5-15°C favorably affects limb metabolism during acute limb ischemia. We have used these data and computer heat transfer models to build a novel tourniquet device that can provide the same cooling to human lower limbs. We are now conducting animal experiments with our prototype device to evaluate the benefit of this approach in extremity trauma.

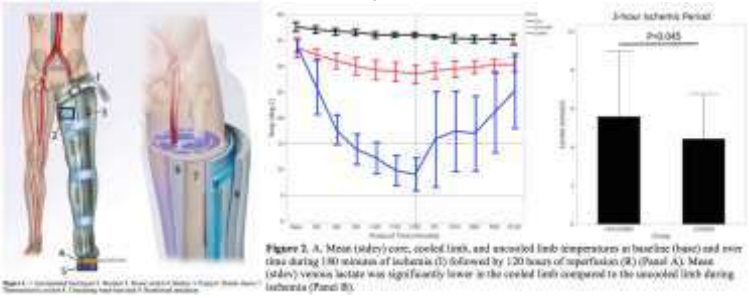


Figure 2. A. Mean (stdev) core, cooled limb, and uncooled limb temperatures at baseline (base) and over time during 180 minutes of ischemia (I) followed by 120 hours of reperfusion (R) (Panel A). Mean (stdev) venous lactate was significantly lower in the cooled limb compared to the uncooled limb during ischemia (Panel B).

NOTES

Session: XIII: Quickshot Session II
Paper QS18: 10:00 - 10:06 AM

DAMAGE CONTROL SURGERY IN WEIGHTLESSNESS: A COMPARATIVE STUDY OF TORSO HEMORRHAGE CONTROL COMPARING TERRESTRIAL AND WEIGHTLESS CONDITIONS

Andrew W. Kirkpatrick* MD, Jessica L. McKee MSc, Homer Tien MD, Anthony LaPorta MD, Kit Lavell DFC, David R. King* MD, McBeth B. Paul MD, Susan Brien MD, Tim Leslie MSc, Derek Roberts MD, Reginald Franciose MD, Vivian McAlister MD, Jonathan Wong BSc, Danielle Bouchard Chad G. Ball* MD, University Of Calgary

Invited Discussant: Christine Gaarder, MD

Introduction: Torso bleeding remains the most preventable cause of post-traumatic death worldwide. Remote Damage Control Resuscitation (RDCR) endeavours to rescue the most catastrophically injured, but has not focused on pre-hospital surgical torso haemorrhage control. We examined the comparative logistics and metrics of intra-peritoneal packing in weightlessness in Parabolic flight (0g) compared terrestrial gravity (1g) as an extreme example of surgical RDCR.

Methods: A customized surgical phantom ("Cut-Suit" – CS) was constructed with high-fidelity intra-peritoneal anatomy, including a simulated vasculature system including a hydraulic "blood" pumping system with flow-meter. A standardized HC task was to explore the CS and identify major "bleeding" (coloured, thickened water - 5 cp) from a stellate liver injury flowing at a constant pressure of 80 mmHg. Ten volunteer surgeons performed RDCR laparotomies on the CS onboard a research aircraft (Falcon 20 – F20), first in 1g followed by 0g. The standardized RDCR laparotomy was sectioned into 20 second windows to enable conduct in Parabolic flight and thereafter comparison between 1g and 0g, "Blood" was pumped only during these time segments. These segments comprised incision, retraction, direction, exploration, hemorrhage-control, and abbreviated closure, with up to 12 windows only permitted to complete the laparotomy. Hemostasis was attempted through standard guzae packing of the liver injury which the surgeons were previously unaware of prior to RDCRL.

Results: All 10 surgeons successfully performed hemorrhage control on the CS in both 1 and 0g. Overall, there was no difference in blood loss between 1 and 0g ($p=0.23$) or in the observation period following packing of the liver injury ($p=0.687$). Compared to RDCRL in 1g, only the identification of bleeding phase in 0g induced more "blood" loss ($p=0.032$). Only the "incision" phase of the RDCRL took longer ($p=0.02$) in 0 versus 1g. Overall surgeons rated their personal physiologic performance and the relative difficulty of DCRL surgery in 0g as "harder" than 1g (median Likert both 2/5). However, surgical instrument control, and conducting all phases of laparotomy and hepatic packing for hemmorhage control were rated equivalent between 1 and 0g (median Likert all 3/5), except for skin closure (Median 1/5).

Conclusion: Performing RDCR laparotomies with packing of a simulated torso exsanguination in a high-fidelity surgical phantom was feasible onboard a research aircraft in both normal and weightless conditions. Despite being subjectively "harder" most phases of operative intervention were rated equivalently, and there was no statistical difference in "blood" loss in weightlessness. Direct Operative control of torso hemorrhage is theoretically possible in extreme environments if logistics are provided for.

NOTES

Session: XIII: Quickshot Session II
Paper QS19: 10:06 - 10:12 AM

THE IMPACT OF ACUTE CARE SURGERY SERVICE ON TIMELINESS OF CARE FOR PATIENTS WHO REQUIRE EMERGENT EXPLORATORY LAPAROTOMY FOR ACUTE ABDOMEN.

Kaori Ito* MD, Hiromichi Ito MD, Michigan State University Dept. Of Surgery

Invited Discussant: Jason Lees, MD

Introduction: Timely surgical intervention is vital to improve postoperative outcomes for patients who undergo emergent exploratory laparotomy (EEL) for acute abdomen (AA). Acute Care Surgery (ACS) is a concept emerged since 2006 which dedicating care for patients who need emergent surgery, trauma, and surgical critical care. Our department developed ACS service since 2013. We conducted this study to assess the impact of ACS service on timeliness of care for patients require EEL for AA and perioperative outcomes.

Methods: Patients who underwent EEL for AA (1/2007 – 1/2014) at our institution were reviewed. EELs for trauma were excluded. Patients' demographics, comorbidities, diagnoses, type of surgery, the estimated mortality rate calculated by the American College of Surgeons National Surgical Quality Improvement Program Surgical Risk Calculator (ACS NSQIP SRC), hours between admission to surgical consultation, hours between admission to operating room, postoperative length of stay (LOS) and in-hospital mortality were recorded. These variables were compared between two groups: Patients who were operated during 1/2007 - 12/2012 (Pre-ACS group) vs Patients who were operated during 1/2013 – 1/2014 (Post-ACS group). Chi square test was used for non-parametric variables. Student's t-test was used for parametric variables.

Results: Five hundred and forty two patients who met inclusion criteria were identified. There were 254 males (47%). The median age was 62 years (range 17 – 98). Types of surgery were as following: upper gastrointestinal tract 23% (n=60), Small bowel 50% (n=271), large bowel 37% (n=202), and others 2% (n=9). The overall in-hospital mortality rate was 15% (n=81). There were 424 patients in the pre-ACS group and 118 patients in the post-ACS group. There were no differences between two groups in demographics, comorbidities, diagnoses, type of surgery, and the estimated mortality rate by ACS NSQIP SRC. Hours between admission to surgical consultation and hours between admission to operating room were shorter in Post-ACS group than Pre-ACS group (7.8±5.4 hours vs 17.1±45.9 hours, $p=0.002$. 8.6±7.1 hours vs 39.6±58.6 hours, $p<0.001$, respectively). Compared to Pre-ACS group, Post-ACS group had shorter postoperative LOS (8.7±7.1 days vs 11.4±17.9 days, $p=0.039$). The in-hospital mortality rate was similar between two groups (15% [63/424] vs 15% [18/118], $p=0.915$).

Conclusion: The development of ACS service improved the timeliness of surgical consultation and operation and eventually associated with shorter postoperative LOS.

NOTES

Session: XIII: Quickshot Session II
Paper QS20: 10:12 - 10:18 AM

NONOPERATIVE MANAGEMENT RATHER THAN ENDOVACSCUALR REPAIR MAY BE SAFE FOR GRADE II TRAUMATIC AORTIC INJURIES: A TEN YEAR RETROSPECIVE ANALYSIS

Steven Spencer MD, Karen Safcsak RN, Chadwick Smith MD, Indermeet Bhullar* MD, Orlando Regional Medical Center

Invited Discussant: J. Wayne Meredith, MD

Introduction: Chest X-rays have a high false negative rate for blunt thoracic aortic injuries (BTAIs). The resulting increased use of chest CT scans combined with significant improvements in the quality of CT scanners has identified an increasing group of patients with minimal aortic injury (MAI) (grade I-II). Although the Society of Vascular Surgery (SVS) guidelines recommend thoracic endovascular aortic repair (TEVAR) for grade II-IV BTAIs and nonoperative management (NOM) only for grade I, there is limited but increasing evidence that grade II may also be observed safely without TEVAR. The purpose of this study was to compare the outcomes of (TEVAR vs. NOM) for grade I-IV BTAIs and determine if grade II can also be safely observed with NOM.
Methods: The records of patients with BTAIs over an 11 year period from 2004 to 2015 at a Level I trauma center were retrospectively reviewed. Images were reviewed by a board certified radiologist and graded according to Society of Vascular Surgery (SVS) guideline (Grade I-IV). Failure of NOM was defined as aortic rupture after admission. Demographics, injury severity score and outcomes were recorded. The failure rate for grade I-IV injuries was compared for the two treatment groups (TEVAR vs. NOM). Statistical analysis was performed with ANOVA test of variance, Fisher's exact test, and $\chi 2$ test.
Results: A total of 105 adult (age>15) patients with BTAIs were identified over the 11 year period. Of these 34 (32%) patients were excluded, 17 (16%) that died soon after arrival due to other injuries prior to addressing aortic injury and 17 (16%) for undergoing operative repair (2004-2007). Of the remaining 71 patients, 48 (68%) had TEVAR and 23 (32%) had NOM. The distribution in each treatment arm by grade was as follows: TEVAR grade I 8 (17%), II 6 (13%), III 16 (33%) and IV 18 (38%); NOM grade I 8 (35%), grade II 8 (35%), and grade III 7 (30%). The failure rate after TEVAR and NOM was 0% for each grade (I-IV). Although MAI (grade I-II) patients that had a TEVAR had a hospital length of stay nearly twice as long as the NOM group, this did not reach significance (TEVAR vs. NOM, 32 vs. 17, p=0.2). There was a significant difference between the times from admission till TEVAR for grade I-II vs. grade III-IV (60 hrs vs. 9 hrs, p=0.04). Two patients (one grade I and one grade II) had their TEVAR procedures delayed for 11 and 18 days respectively, till significant infections could be cleared, questioning the need for the TEVAR at all. Eight patients with grade I had an unnecessary TEVAR and should have been observed based on SVS guidelines with NOM. Seven patients with grade III injuries that could not undergo TEVAR due to anatomy or medical conditions also had a 0% failure rate with NOM. Follow up CT scans for the 23 NOM patients showed progression in 2 patients (one from grade I to II, and one from grade II to III), no change in 18, and resolution in 3 grade I injuries.
Conclusions: Although the Society of Vascular Surgery (SVS) guidelines recommend thoracic endovascular aortic repair (TEVAR) for grade II-IV blunt thoracic aortic injuries and NOM only for grade I injuries, grade II injuries may also be safe for NOM. Given the small patient population, future multicenter studies with long term follow up will be needed to evaluate which grades can be safely observed with NOM.

NOTES

Session: XIII: Quickshot Session II
Paper QS21: 10:18 - 10:24 AM

IMPROVED PREDICTION OF MOF BY NON-INVASIVE ASSESSMENT OF MICROCIRCULATORY CHANGES AFTER SEVERE SHOCK AND RESUSCITATION IN TRAUMA

Alberto F. Garcia MD, Gustavo A. Ospina MD, Edgardo Quinones MD, Humberto J. Madrinan MD, Paola A. Rodriguez MD, Juan C. Puyana* MD, Fundacion Valle del Lili

Invited Discussant: Gregory Victorino, MD

Introduction: Blood product resuscitation following severe hemorrhage is associated with impaired microcirculation and have been associated to multiorgan dysfunction during inflammatory conditions such as severe sepsis and septic shock. The relationship between commonly used parameters of hypo-perfusion such as lactic acid and accurate quantitative measurements of impaired micro-circulation remains elusive. In this investigation, we assessed microcirculation in vivo and compared it with markers of hypo-perfusion measured on admission, in order to better predict the occurrence of MOF after hemorrhage.

Methods: Adult trauma patients, admitted to the ICU after interventions for hemorrhage control were prospectively included. Microcirculation was examined with side-stream dark field imaging. MOF was defined as two or more SOFA organ scores ≥3 during hospitalization. Associations were evaluated with simple and multiple logistic regressions (MLR) and discriminative ability with AU-ROC.

Results: Forty-three patients were included, 41 males, mean age 29.2, (SD ±8.8). Penetrating trauma occurred in 88.7%. Median RTS was 6.9 (IQR 5.9–7.8), median ISS was 25 (IRQ 16–29). The most common bleeding sources were lung in 34.9%, liver/spleen in 32.2% and abdominal vessels in 25.6%. Mean of blood loss was 2242.2 ±1296.9 ml. PRBC were transfused in 81.4% of the patients. Massive transfusion criteria were met in 44.7%. MOF occurred in 7 subjects (16.3%). Microcirculatory findings immediately upon arrival to ICU, were significantly lower in MOF patients. Lactic acid (LA) and base deficit were significantly higher in this subset of patients. (Table)

Table. Comparison of perfusion variables between MOF and no-MOF patients

Variable	No MOF	MOF	P	AU-ROC
Lactic acid	3.2	8.3	<0.001	0.84
Base deficit	6.8	14.3	0.002	0.79
% Perfused small vessels*	94.5%	84.9%	0.002	0.79
Micro-vascular flow index*	2.8	2.3	0.027	0.71
Functional capillary density*	8.2	6.3	<0.001	0.82
Total capillary density*	11.7	10.4	0.024	0.72

* *Side-stream dark field imaging*

Of the microcirculation parameters, functional capillary density (FCD) discriminated best the risk of MOF (AUROC 0.82, CI-95% 0.69-0.95). The best MLR model identified independent contribution of LA (OR 1.66, CI-95% 1.08-2.56, p=0.022) and FCD (OR 0.13, CI-95% 0.02-0.98, p=0.049) to the MOF risk, (AUROC 0.94, CI-95% 0.87-1.00).

Conclusion: Microcirculatory alterations (MA) measured here independently and significantly predicted MOF after trauma. Our ability to predict MOF was significantly improved when bedside measurements of MA were combined with LA. The hysteresis of these findings deserves further investigation.

NOTES

Session: XIII: Quickshot Session II
Paper QS22: 10:24 - 10:30 AM

FROM SKIN TO WITHIN – A COMPARISON OF THREE TISSUE PERFUSION MEASUREMENT TECHNIQUES AND IDENTIFICATION OF SURVIVAL THRESHOLDS

David S. Inouye MD, Ph.D., Michael S. Hayashi* MD, Danny Takanishi Jr., MD, Richard Severino MS, Mihae Yu* MD, The Queen's Medical Center

Invited Discussant: Gail Tominaga, MD

Introduction: Measuring tissue perfusion may identify states of occult shock leading to earlier treatment and shock reversal. Several non-invasive techniques provide quantitative measurements of tissue perfusion. Transcutaneous pO2(PtcO2) changes with PaO2 and FiO2 in non-shock states, but during shock, PtcO2 approximates cardiac output with minimum response to increasing PaO2 and PaO2 due to vasoconstriction of the skin. This response is called the Oxygen Challenge test (OCT) and has been shown to predict organ failure, mortality, and used as an endpoint of resuscitation. An OCT value of $\geq$ 25 mmHg implies adequate perfusion and < 25 mmHg implies shock (1). The perfusion index (PI), based on pulse co-oximetry measurements at multiple wavelengths (Masimo, Irvine CA) provides an alternative measurement of skin and fingernail bed tissue perfusion. Near-infrared spectroscopy measurements of tissue hemoglobin oxygen saturation (StO 2, Hutchinson Technologies, Hutchinson MN) can also provide a composite measurement of skin to thenar muscle tissue oxygenation. Despite the differences between these perfusion measurements, lower values are associated with severity of illness and/or increased mortality.

Methods: Measurements of OCT, PI,and StO2, were obtained in 79 critically-ill adults with pulmonary artery catheters during resuscitation and throughout the ICU stay. Perfusion measurements obtained near the 24-hr point of resuscitation were used in this analysis. The area under the receiver operating characteristic curve (AUROC) for survival was used to compare the three methods. Survival thresholds were selected from positive and negative predictive (PPV & NPV) curves generated for each method. Chi-squared tests were then performed at the selected thresholds.

Results: Demographics of the 79 patients were: 67±16 years of age, 49 males: 30 females, APACHE II 25.9±7.8, 49 septic shock/severe sepsis, 21 hemorrhagic shock, 19 cardiac failure, and 60 respiratory failure patients (several patients had more than one diagnosis). Fifty-five of the 79 subjects survived to discharge or transfer to other acute care facilities. The OCT demonstrated an optimal range from 15-30 mmHg and was superior to PI or StO 2 (AUROC=0.71 vs 0.67 vs 0.56, respectively.) An OCT threshold of 25 mmHg yielded a PPV=84% and NPV=67% (p=<0.001). A PI threshold value of 2.4 yielded a PPV=82% and NPV=46% (p=0.02). There was no clear threshold value for StO2 at 24hrs.

Conclusion: Noninvasive tissue perfusion measurements can provide useful information during resuscitation. In this mixed cohort of critically-ill patients, the OCT with a threshold value of 25 mmHg at 24h was most closely associated with survival. A PI of 2.4 or greater at 24h was also associated with survival. However, StO2 at 24h was unable to demonstrate a relationship to survival in this investigation. Further investigation is needed to determine the relation of these perfusion measurements in the treatment of shock.

1) Yu M et al, Shock 2007;27:615.

NOTES

Session: XIII: Quickshot Session II
Paper QS23: 10:30 - 10:36 AM

COMPENSATORY RESERVE INDEX: PERFORMANCE OF A NOVEL MONITORING TECHNOLOGY TO IDENTIFY THE BLEEDING TRAUMA PATIENT

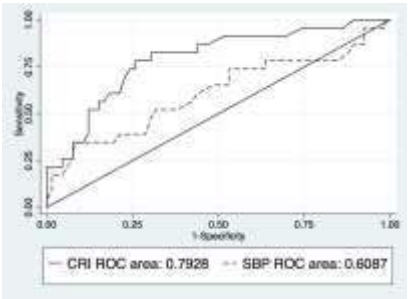
Michael Johnson MD, Abdul Alarhayem MD, Victor Convertino Ph.D., Robert Carter III, Ph.D., Kevin Chung MD, Ronald Stewart* MD, John Myers* MD, Daniel Dent* MD, Lilian Liao* MD, Ramon Cestero MD, Susannah Nicholson MD, Mark Muir MD, Martin Schwaca Ph.D., David Wampler Ph.D., Brian Eastridge* MD, University of Texas Health Science Center at San Antonio

Invited Discussant: Raymond Fang, MD

Introduction: Hemorrhage is the most substantial cause of death after injury. Standard measures of systolic blood pressure (SBP) and heart rate (HR) have been demonstrated to be poor surrogate indicators of physiologic compromise until normal compensatory mechanisms have been overwhelmed. Compensatory Reserve Index (CRI) is a novel noninvasive monitoring technology that has the ability to continuously assess physiologic reserve with feature extraction of real time arterial pulse waveforms. We hypothesized that CRI would be a better predictor of physiologic compromise secondary to hemorrhage than traditional vital signs.

Methods: A prospective observational study of 89 subjects that met trauma center activation criteria at a single level I trauma center was conducted between October 2015-February 2016. The CRI finger probe device was placed on injured patients upon arrival to the trauma resuscitation unit and remained in place until admission. CRI was represented by values between 0 (no reserve) and 1 (full reserve). Data collected included patient demographics, systolic blood pressure (SBP),heart rate (HR), shock index (SI) and requirement for hemorrhage-associated Life Saving Intervention (LSI) (operation or angiography for hemorrhage, compression or tourniquet control of external bleeding, transfusion > 2 u PRBC). Using admission physiologic monitoring values, receiver-operator characteristic (ROC) curves were formulated and appropriate thresholds were calculated for prediction modeling.

Results: Using a threshold values of SBP < 110, SI < 0.9, and CRI < 0.70, prediction analyses were obtained. For predicting hemorrhage, CRI demonstrated a sensitivity of 83% and a negative predictive value (NPV) of 91% as compared to SBP and SI where the sensitivity to detect hemorrhage were 26% ($p < 0.05$) and 39% ($p < 0.05$) respectively. Comparing the NPV of the traditional vital signs to CRI, SBP had an associated NPV of 78% while SI had a NPV of 81% . ROC curves generated from admission CRI and SBP measures demonstrated values of 0.793 and 0.609 respectively (See Figure). CRI identified significant hemorrhage requiring therapy more reliably than SBP or SI ($p < 0.05$).



Conclusion: The CRI device outperformed standard vital signs in the acute resuscitation phase after injury. This novel monitoring technology offers promise for potential applications to triage and resuscitation of injured patients, in the field and in the hospital.

NOTES

Session: XIII: Quickshot Session II
Paper QS24: 10:36 - 10:42 AM

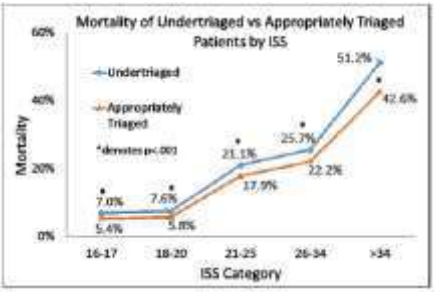
UNDERTRIAGE OF SEVERELY INJURED ADULTS IN THE UNITED STATES: WHO IS NOT GETTING TO THE RIGHT PLACE AT THE RIGHT TIME?

Jennifer M. Leonard MD, Ph.D., Stephanie F. Polites MD, Amy E. Glasgow MHA, Martin D. Zielinski* MD, Elizabeth B. Habermann MPH, Ph.D., Mayo Clinic – Rochester

Invited Discussant: Jeffrey Salomone, MD

Introduction: Severely injured patients should receive care at high acuity trauma centers to avoid preventable mortality according to the ACS Committee on Trauma. Undertriage (UT) is said to occur when these patients are cared for at lower acuity centers. The purpose of this study was to determine if the goal UT rate of <5% was met in recent years and if characteristics of UT patients can be identified in a national cohort.
Methods: Severely injured (ISS ≥16) adults aged 16 years or greater were identified from the 2010-2012 National Trauma Data Bank. UT was defined as those who received definitive care or died (i.e. not transferred) at hospitals without state or ACS level I or II verification. Mortality by ISS was compared between UT and appropriately triaged patients. Multivariable logistic regression was used to determine independent risk factors for UT and the impact of UT on mortality. Covariates included patient demographics, mechanism, injury severity, and comorbidity.
Results: Of 355,510 severely injured patients, 17,433 were UT (4.9%). Younger, less severely injured, and certain minority patients were most likely to be UT (Table). After risk adjustment, older age, greater ISS, black race, and comorbidity were protective against UT while younger patients and other minorities were at increased risk of UT (all p<.05). Mortality was greater in UT patients regardless of ISS (Figure). This was confirmed by multivariable analysis which found greater odds of death in UT patients (OR=1.14, p<.001).

Covariate		Undertriaged	Appropriately Triaged	p value
Age (years)	<18	970 (8.9%)	9904 (91.1%)	<.001
	18-40	5541 (4.3%)	123663 (95.7%)	
	41-64	5429 (4.5%)	116053 (95.5%)	
	≥65	5493 (5.8%)	89667 (94.2%)	
Sex	Female	5440 (5.1%)	101288 (94.9%)	<.001
	Male	11993 (4.8%)	235791 (95.2%)	
Race	White	11494 (4.3%)	242596 (95.5%)	<.001
	Black	1403 (3.1%)	43350 (96.9%)	
	Other minority	4536 (8.0%)	52131 (92.0%)	
ISS	16-17	7025 (5.6%)	118470 (94.4%)	<.001
	18-20	2255 (5.5%)	38688 (94.5%)	
	21-25	4058 (4.7%)	81465 (95.3%)	
	26-34	2751 (3.9%)	67129 (96.1%)	
	>34	1344 (4.0%)	32325 (96.0%)	



Conclusion: The UT goal of <5% was met in this study; however, a substantial number of severely injured patients received definitive care at lower acuity centers. Since this was associated with increased mortality, triage systems and trauma center capacity can be further refined to better care for these patients in the future. Patients with risk factors for UT identified in this study should be specifically targeted for improved triage.

NOTES

Session: XIII: Quickshot Session II
Paper QS25: 10:42 - 10:48 AM

THE LUNG RESCUE UNIT (LRU) - DOES A DEDICATED INTENSIVE CARE UNIT FOR VENO-VENOUS EXTRA-CORPOREAL MEMBRANE OXYGENATION (VV ECMO) IMPROVE SURVIVAL TO DISCHARGE?

Jay Menaker* MD, Katelyn Dolly RRT, Raymond Rector CCP, LP, Joseph Kufera MA, Eugenia E. Lee MD, Ali Tabatabai MD, Ronald P. Rabinowitz MD, Zachary Kon MD, Pablo Sanchez MD, Si Pham MD, Daniel L. Herr MD, James V. O'Connor* MD, Deborah M. Stein* MD, MPH, Thomas M. Scalea* MD, University of Maryland Medical Center

Invited Discussant: Lena Napolitano, MD, MPH

Introduction: The use of veno-venous extra corporeal membrane oxygenation (VV ECMO) for acute respiratory failure/distress syndrome (ARF/ARDS) has increased since 2009. Despite this, data from the international ELSO registry has not shown a statistical increase in survival to discharge. Specialized units for patients requiring VV ECMO are not standard and patients are often cohorted with other critically ill patients. The purpose of this study was to compare the survival rates to discharge from a unique, newly created, dedicated multi-disciplinary intensive care unit, with standardized care for adult patients requiring VV EVMO for ARF/ARDS, to national and international rates.

Methods: We retrospectively collected data on all adult patients admitted to the LRU between January 1st, 2015 and December 31st, 2015. All patients that were on VV ECMO for the indication of respiratory failure were enrolled. Demographics, past medical history, pre-ECMO data, indication for VV ECMO as well as duration of ECMO and survival to decannulation and discharge were recorded. Means (+ standard deviation) and medians (interquartile range [IQR]) were reported when appropriate. Pearson's chi-square statistic was used to compare survival rates. A p-value below 0.05 was considered statistically significant.

Results: 49 patients were treated with VV ECMO during the study period. Mean age was 46 years (±16). 35 (71%) were male. Median PaO2/FiO2 ratio prior to cannulation was 66 (IQR 53-86). Median ventilator days prior to cannulation was 2 (IQR=1-4). Median time on VV ECMO for all patients was 311 hours (IQR=203-461). Overall, 38 (78%) patients were successfully decannulated with 35 (71%) patients surviving to hospital discharge. When compared to an international cohort from the ELSO database with survival to discharge rates of 54% for a similar VV ECMO patient population, we demonstrated a relative increase in survival to discharge of 31% (p=0.02). When compared to a similar cohort of VV ECMO patients in the United States alone, we demonstrated a 39% relative increase in survival to discharge (71% vs 51%, p=0.008).

Conclusion: The use of VV ECMO for ARF/ARDS is increasing. We have demonstrated that a dedicated multi-disciplinary intensive care unit for the purpose of providing standardized care with specialized trained providers can significantly improve survival to discharge for patients that require VV ECMO for ARF/ARDS.

NOTES

Session: XIII: Quickshot Session II
Paper QS26: 10:48 - 10:54 AM

PROGNOSTIC VALUE OF PRE-OPERATIVE IMAGING AND OPERATIVE FINDINGS IN YOUNG MEN WITH ACUTE APPENDICITIS

Madhu Subramanian BS, MD, Gabriella Nguyen BS, Ryan P. Dumas MD, Michelle Arevalo BS, Erica I. Hodgman MD, Kevin Li BS, Tochi Ajiwe BS, Kareem Abdelfattah MD, Brian Williams* MD, Alexander L. Eastman* MD, MPH, Stephen Luk* MD, Christian T. Minshall MD, Ph.D., Michael W. Cripps MD, University of Texas Southwestern

Invited Discussant: Carlos Brown, MD

Introduction: Pre-operative imaging in suspected appendicitis is ubiquitous. Although useful in women of child-bearing age, we question its use in young men with clinical findings suggestive of appendicitis. Identifying perforated appendicitis is often cited as the indication for imaging. We sought to determine the utility of pre-operative imaging in both management strategy and effects on morbidity in young men with suspected appendicitis.

Methods: At our high-volume, public hospital we conducted a retrospective review of men 18 to 35 years of age who underwent appendectomy from December 2010 – December 2013. Appendicitis was suspected if abdominal pain was localized to the right lower quadrant. Demographics, pre-operative history and exam findings, imaging results, operative reports, and outcomes were collected. The cohort was divided based on whether they were imaged prior to operation. The primary outcome was intraoperative diagnosis of complicated appendicitis. Secondary outcomes included major morbidity (Clavien-Dindo score ≥ 2) and negative appendectomy.

Results: A total of 1164 patients underwent an appendectomy; 418 were young men and only 131 (31.3%) had no pre-operative imaging. Anorexia (45.0% vs. 33.4%, $p = 0.02$) and pain exclusively in the right lower quadrant (97.7% vs. 84.3%, $p < 0.001$) were more common among those not imaged. Time to antibiotic administration (3.1 hours vs. 6.1 hours, $p < 0.001$) and time to appendectomy (7.1 hours vs. 10.7 hours, $p < 0.001$) were greater in the imaged group. There was no difference in rates of complicated appendicitis (15.3% vs. 17.1%), negative appendectomy (3.8% vs. 2.8%) or morbidity (10.7% vs. 6.6%) between groups ($p > 0.05$). Imaging was not accurate in identifying patients with intra-operative diagnosis of complicated appendicitis (sensitivity (SEN) 28.6%, positive predictive value (PPV) 87.5%). Pre-operative imaging suggesting perforation/abscess was not associated with post-operative morbidity (SEN 5.3%, PPV 6.3%). Intra-operative findings of complicated vs. non-complicated appendicitis were more predictive of major morbidity than imaging (SEN 42.1%, specificity 84.7%, negative predictive value 95.4%). On multivariate analysis, the operative diagnosis of complicated appendicitis was the only factor associated with major morbidity (OR = 2.56, $p = 0.01$).

Conclusion: In young men with a high clinical suspicion of acute appendicitis, pre-operative CT scan does not add prognostic value over operative findings. This population should proceed directly to surgery to avoid delays to definitive care.

NOTES

POSTERS

(TAB #4)

POSTERS

(TAB #4)

Poster # 1

COLON INJURY IN DAMAGE CONTROL SURGERY: IS IT SAFE TO DO A DELAYED ANASTOMOSIS?

Leah C. Tatebe MD, Andrew Jennings MD, Michael Smith MD, MPH, Tai Do MD, Alexandra Handy BA, Ken Tatebe MD, Ph.D., Purvi Prajapati BS, Gerald Ogola Ph.D., Monica Bennett Ph.D., Rajesh R. Gandhi* MD, Ph.D., Stephen Luk* MD, Laura B. Petrey* MD, Baylor University Medical Center

Introduction: Delayed colonic anastomosis with damage control laparotomy (DCL) has been considered as an alternative to colostomies during a single laparotomy (SL) in high-risk patients. The literature, however, suggests increased leak rates with DCL between 7-27%. Reported risk factors for anastomotic leak vary widely across studies. We sought to evaluate the regional experience to better elucidate risk for anastomotic leak in DCL.

Methods: A multi-center retrospective cohort study was performed as a collaboration of 3 metropolitan Level I trauma centers. Traumatic colon injuries from January 2006 through June 2014 were included. Exclusion criteria included rectal injuries and death within 24 hours of presentation. Demographics, comorbidities, injury characteristics, complications, medical and operative interventions were compiled and compared between the SL and DCL groups. Logistic regression analysis was performed for any complication with a minimum of 20 occurrences. We utilized regional hospital council readmission data to identify patients who presented after discharge to any member hospital within 1 year of the index admission to better capture complications.

Results: Out of 267 qualified patients, penetrating injuries accounted for 69%, and overall mortality rate was 4.9%. Fifty-six patients (21%) underwent DCL, many with multiple injuries. A total of 179 had a primary repair (26 in DCL), 89 had a resection and anastomosis (28 in DCL), 18 had an end colostomy (10 in DCL), and 9 had a diverting loop ileostomy (2 in DCL). One-third (19) of DCL patients had injuries repaired in a delayed manner during subsequent laparotomies. Patients selected for DCL were statistically more likely to be hypotensive, transfused >6 units of packed red blood cells, receive 3-4 liters more crystalloid, and suffer from adult respiratory distress syndrome, pneumonia, acute kidney injury, and death. Only 5 leaks were identified (1.8%), proportionately distributed between DCL and SL ($p=1.00$), along with 3 enterocutaneous fistulas (ECF, $p=0.51$). Given the small incidence, we were unable to perform meaningful analysis to determine risk factors for leaks. No difference was seen in the incidence of intraabdominal abscesses ($p=0.13$) or surgical site infection (SSI, $p=0.70$) between DCL and SL. DCL patients with concomitant liver injuries had a trend toward increased risk of abscess formation ($p=0.06$), whereas SL patients with pancreas injuries were at increased risk of abscess ($p<0.01$). No difference in complications was noted in DCL patients who underwent definitive colon repair at the initial operation compared to a subsequent operation.

Conclusion: Our regional data do not suggest any increase in complication rate for anastomotic leaks, ECF, SSI, or intraabdominal abscesses within the DCL cohort despite one-third of patients having delayed repair. This is contrary to previous lower-powered studies, which demonstrated higher leak rates. A large multi-institution prospective trial would be indicated to further characterize the risks of DCL in colon trauma.

Poster # 2

IS IT SAFE? NON-OPERATIVE MANAGEMENT OF BLUNT SPLENIC INJURIES IN GERIATRIC PATIENTS

Marc D. Trust MD, Sadia Ali MPH, Lawrence Brown Ph.D., Adam Clark MBA, Jayson Aydelotte* MD, Ben Coopwood* MD, Pedro Teixeira* MD, Carlos V. Brown* MD, Dell Medical School At The University Of Texas At Austin

Introduction:Previous surgical dogma dictated that older age was a contraindication to non-operative management (NOM) of blunt splenic injuries (BSI). This was based on documented increased failure rates and the concern for increased mortality associated with failure. As many studies have shown the efficacy of NOM, there has been an increased use of this treatment strategy in the geriatric population. However, no recent study has been published assessing the safety of NOM of BSI in this population.

Methods:We performed a retrospective analysis of data from the National Trauma Databank (NTDB) from 2014 and identified young (age < 65) and geriatric (age ≥ 65) patients with a BSI. Patients who underwent immediate splenectomy (within 6 hours of admission) were excluded from the analysis. Outcomes were failure of NOM and mortality.

Results:We identified 18,917 total patients with a BSI, 2,240 (12%) geriatric patients and 16,677 (88%) young patients. 14% of geriatric patients and 13% of young patients underwent immediate splenectomy and were excluded from further analysis. Geriatric patients failed NOM more often than younger patients (6% vs. 4%, $p < 0.0001$). On logistic regression analysis, high ($\geq$16) ISS was the only independent risk factor associated with failure of NOM in geriatric patients (OR=2.8, CI=1.8 – 4.4, $p < 0.0001$). There was no difference in mortality in geriatric patients who had successful versus failed NOM (11% vs. 15%, $p = 0.22$). Independent risk factors for mortality in geriatric patients who underwent NOM included admission hypotension (OR=1.5, CI=1.0 – 2.4, $p = 0.049$), high ISS (OR=3.8, CI=2.6 – 5.8, $p < 0.0001$), low GCS (OR=5.0, CI=3.5 – 7.2, $p < 0.0001$), and pre-existing cardiac disease (OR=3.6, CI=2.0 – 6.6, $p < 0.0001$). However, failure of NOM was not independently associated with mortality (OR=1.4, CI=0.8 – 2.6, $p = 0.25$).

Conclusion:When compared to younger patients, geriatric patients had a higher but acceptable rate of failed NOM of BSI, and failure rates in our geriatric population are lower than previously reported. Failure of NOM in geriatric patients is not associated with an increase in mortality. Based on our results, NOM of BSI in geriatric patients is safe.

Poster # 3

REGIONALISTAION OF MAJOR TRAUMA IN ENGLAND IMPROVES THE OUTCOME OF SEVERE LIVER INJURIES.

EYAD ISSA MD,Ph.D., Tina Gaarder* MD, Pal Aksel MD, Adam Brooks MD, East Midlands Major Trauma Centre

Introduction: Regionalisation of major trauma in England in April 2012 re-directed severely injured patients to Major Trauma Centres (MTC) whilst less injured patients went to Trauma Units (TU). This has delivered an overall improvement in survival, however outcomes in specific injuries have not been evaluated. Severe liver trauma (Grade IV and V) is recognised to have high mortality although contemporary national outcome for patients in England with these injuries have not previously been reported. The aim of this study was to define the contemporary mortality associated with severe liver injury in England, as well as, to investigate the effect of the regionalisation of major trauma on outcome for patients with severe liver injuries.

Methods: Trauma Audit Research Network (TARN) data for patients, who presented between April 2010 and March 2015, were between 16 and 65 years old, alive on admission and had injury severity score (ISS) $\geq$ 15 and at least liver injury, were retrieved. Outcome (mortality) was compared before and after regionalisation and also between MTCs and TUs.

Results: A total of 1790 patients met the inclusion criteria. 449 patients had a liver injury of grade IV or above. The overall mortality for severe liver trauma in England since April 2012 is 19%, and this has improved significantly since regionalisation (19% vs 31%; Odds ratio [OR], 1.82; 95% confidence interval [CI], 1.16 -2.8; P=0.007). Similarly, the outcome of trauma patients with severe liver injury in MTCs has improved since regionalisation (16% vs 27 %; OR 0.51; 95% CI, 0.29-0.89; P=0.01). Patients with severe liver injury admitted to TUs after April 2012 had higher mortality compared to those admitted to a MTC (36% vs 16%; OR, 0.33; 95% CI, 0.17-0.65).

Conclusion: The mortality of severe liver trauma remains high, however regionalisation of major trauma in England is associated with improved outcome in this patient group. Further improvements could be delivered with better triage to MTCs.

Poster # 4

THE ROLE OF PROCALCITONIN IN THE DECISION TO CLOSE OPEN ABDOMENS AFTER DAMAGE CONTROL LAPAROTOMY

Rondi B. Gelbard MD, Marcus Darrabie MD, Christopher Dente* MD, Bryan C. Morse MD, Stacy D. Dougherty MD, Neal N. Iwakoshi Ph.D., Timothy G. Buchman MD, Ph.D., Eric Elster MD, Emory University

Introduction: Damage control laparotomy (DCL) followed by temporary abdominal closure, resuscitation and planned re-laparotomy is used to manage critically injured patients who cannot be closed primarily at the initial operation. Patients that undergo successful primary fascial closure at the initial operation may have a biomarker profile that is distinct from those who are managed with an open abdomen. The purpose of this study was to evaluate whether procalcitonin (PCT), as a modulator of immunologic function, is associated with delayed fascial closure after laparotomy.

Methods: This is a prospective, observational study of patients requiring exploratory laparotomy for blunt or penetrating injury at an urban Level 1 trauma center. Serial tissue, serum and peritoneal effluent samples were collected during each operative intervention from initial laparotomy to abdominal closure. Demographic and physiologic data, as well as local and systemic biomarker and quantitative bacteriology data were analyzed and compared among patients that achieved definitive fascial closure at the initial operation versus those that did not. Outcome measures included overall survival, hospital length of stay, intensive care unit length of stay, ventilator days, time to abdominal wound closure, wound complications, and discharge disposition.

Results: Sixty-one trauma patients met inclusion criteria for the study, 31 of these were managed with DCL while 30 underwent definitive primary fascial closure at the initial operation. In addition to increased ICU and overall length of stay, univariate analysis revealed that DCL patients had higher peak serum and wound effluent PCT levels (23.0 ± 7.8 ng/ml vs 0.11 ± 0.02, $p<0.01$). Peak PCT was also found to correlate with increasing bacterial isolates in peritoneal fluid samples (R 2 0.08, p 0.03). Among the DCL patients, median time to abdominal closure was 4 days (IQR-5). Wound effluent PCT was found to correlate with time to definitive closure. Stepwise regression analysis identified peak serum PCT and mechanism of injury as independent risk factors for DCL (OR 41.3, [CI-3.65-5195] and OR 3.50 [1.26-10.6] respectively).

Conclusion: Elevated peak serum and wound PCT appear to be associated with delayed fascial closure after DCL. Identifying risk factors for delayed fascial closure may help to avoid the complications of multiple attempts to close, and optimize the chance of a successful planned staged ventral hernia. This could shorten time to recovery and potentially prevent some of the complications seen after DCL in this population.

Poster # 5

EARLY MOBILIZATION OF PATIENTS WITH NON-OPERATIVE LIVER AND SPLEEN INJURIES IS SAFE AND COST EFFECTIVE

Amanda Teichman MD, Brendan McCracken MD, James Eakins MD, Hahnemann University Hospital

Introduction: Currently there is no standard for the management of non-operative solid organ injuries. Previous studies have established that early ambulation is safe, however our aim is to show that early mobilization (EM) decreases hospital length of stay (LOS), ICU LOS, and cost without increasing adverse events.

Methods: Prior to 2011, patients with non-operative liver and spleen injuries (LSI) were managed with a minimum of 3 days of bed-rest. In 2011 the protocol was amended such that patients with a stable hemoglobin may be out of bed the morning after admission for grade 1 and 2 injuries, and after at least 24 hours for grade 3 or higher injuries, or those with free intra-peritoneal fluid on CT. A retrospective chart review was conducted looking at all patients with LSI from 2008 through 2011, when prolonged bed-rest (PBR) was observed, and from 2011 through 2014, when EM was instituted. Data collection consisted of length of bed-rest, hospital LOS, ICU LOS, failure of non-operative management (NOM), and mortality. Patients that were excluded were those with penetrating trauma, confounding injuries to other body systems requiring management above and beyond what would have been required for their LSI, patients who went straight to the operating room from the emergency department for their LSI, and those patients for whom complete data is unavailable in the medical record. Analysis was performed using a student t-test to evaluate length of bed-rest, hospital LOS, and ICU LOS.

Results: Prior to initiation of EM in 2011 there were 300 patients with LSI, of which 211 were excluded, leaving 89 eligible for the study. From 2011-2014, there were 251 patients with LSI, 152 were excluded, and 99 left meeting study criteria. Between the two groups, there was no significant difference in the male to female ratio, age, grade of injury, ISS, or mechanism of injury (MOI). Data analysis demonstrated that the PBR group had a significantly longer average hospital LOS, 5.89 days, versus 3.36 days in the EM group. There was also a statistically significant difference in the mean ICU LOS, 4.59 days versus 1.75 days in the PBR and EM groups, respectively. Using current hospital data, the average cost for a single ICU day is $13,709 and $7,136 for a regular bed. Extrapolating this data to the EM group, that's an average savings of $38,897 per ICU stay and $10,533 per stay in a regular room. There was only one failure of NOM in either group. This was a patient in the PBR group who required a splenectomy 2 days following spleen embolization (performed on the day of admission). Both the PBR and EM groups had a 2% mortality rate.

Conclusion: This study examines a homogenous patient population, at a level I trauma center over several years. We found that not only is EM in non-operative LSI safe, it also lowers hospital LOS, ICU LOS, and decreases healthcare costs. In addition, these effects were demonstrated without adversely affecting failure of NOM or patient mortality.

Poster # 6

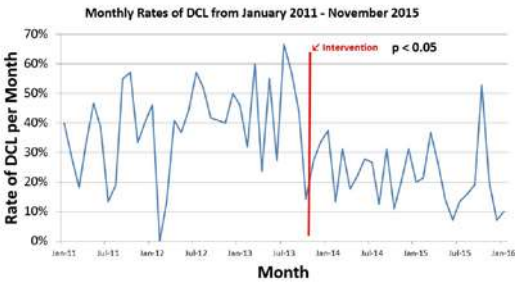
DECREASING THE UTILIZATION OF DAMAGE CONTROL LAPAROTOMY: A QUALITY IMPROVEMENT PROJECT

John A. Harvin MD, Curtis J. Wray MD, Ryan A. Lawless MD, Michelle K. McNutt MD, Sasha D. Adams* MD, Joseph D. Love DO, Laura J. Moore* MD, Bryan A. Cotton* MD,MPH, Charles E. Wade* Ph.D., John B. Holcomb* MD, University of Texas Health Science Center-Houston

Introduction: Our institution has published damage control laparotomy (DCL) rates of 38% and documented the substantial morbidity associated with the open abdomen. Despite this, our DCL rates remained unchanged and there were patients undergoing DCL who may have safely undergone definitive laparotomy (DEF). The purpose of this quality improvement (QI) project was to decrease our rate of DCL while monitoring morbidity and mortality.

Methods: A prospective cohort of all emergent trauma laparotomies from 11/2013-10/2015 (QI period) were followed. During year one, trauma faculty completed report cards immediately following each DCL. During year two, our group collectively reviewed DCLs every other month to determine which patients may have safely undergone DEF. Morbidity and mortality of the QI patients were compared to our published historical control (HC) group of patients undergoing emergent laparotomy (01/2011-10/2013).

Results: The DCL rate in the HC group was 38%. A significant DCL rate decrease was observed immediately upon beginning the QI project, with an overall rate for the QI group of 23% ($p<0.05$). Of the 101 DCLs performed during the QI period, 27 were judged to have been patients who could have safely undergone DEF, leaving a 17% theoretical rate of DCL during the QI period. For surgeons with ≥25 laparotomies, surgeon-specific rates of DCL ranged from 13-44%. Of the seven surgeons observed, four had a DCL rate above 17%. These four did not differ in age, years in practice, or residency program, but were more likely to have completed fellowship at our institution (100% v 0%, p=0.03). There were no differences in demographics, Injury Severity Score, operative transfusions, or estimated blood loss between the two groups. No differences in morbidity, including organ/space infection (HC 16% vs QI 12%, p=0.15), fascial dehiscence (6% vs 8%, p=0.20), acute renal failure (13% vs 13%, p=0.85), unplanned re-laparotomy (11% vs 10%, p=0.58), ileus (19% vs 23%, p=0.12), or mortality (9% vs 10%, p=0.69), were observed.



Conclusion: A QI project to openly share surgeon-specific rates, indications, and group-adjudicated appropriateness of DCL resulted in an immediate, significant, and sustained decrease in the rate of DCL, from 38% to 23%. This decrease was not associated with increased morbidity or mortality.

Poster # 7

FEVER TRENDS AND UTILITY OF EARLY BROAD SPECTRUM ANTIBIOTIC THERAPY IN PEDIATRIC SEVERE BURN PATIENTS

Lindsay J. Talbot MD, Renata Fabia MD, Ph.D., Jonathan Groner* MD, Brian Kenney MD, MPH, Rajan Thakkar MD, Nationwide Children's

Introduction: There is considerable debate about the clinical indications for initiation of broad spectrum antibiotic therapy in early treatment (first 48 - 72 hours) of severe burn patients. This study examines the early fever pattern in severe burn patients and the utility of early initiation of broad spectrum antibiotics in preventing late infectious complications.

Methods: Institutional IRB approval was obtained prior to the initiation of this study. A retrospective review (2009 - 2015) was performed of an institutional prospectively-maintained burn registry. Patients < 18 years of age admitted with total body surface area (TBSA) thermal injury greater than 15% were included. Exclusion criteria included age > 18 years, death within 72 hours of admission, and concomitant non-burn traumatic injuries. All parametric data were examined using Student's t-test and non-parametric data were analyzed using Chi-squared analysis. The initial fever pattern was examined and infectious outcomes were compared between patients receiving broad spectrum antibiotic therapy within the first 48 hours post-injury and those who did not receive early antibiotic therapy. Multivariate analysis was performed for all outcomes based on a priori hypotheses.

Results: Fifty two patients met inclusion criteria. Median age was 4 years (IQR 2 – 11.8 years), with 75% male. Median TBSA was 21.6% (IQR 16 – 32.8%). At 48 hours post injury, Tmax averaged 38.8 degrees Centigrade, and 81% of patients had Tmax greater than 38.0 degrees Centigrade. At 72 hours post injury, Tmax was 40 degrees Centigrade, and 88% of patients experienced fever > 38.0 degrees Centigrade. 25% of patients received broad spectrum antibiotic therapy within the first 48 hours after injury and 44% within 72 hours. Multivariate regression controlling for TBSA, body weight, and initial ED disposition (ICU versus floor bed) demonstrated no difference in late infectious outcomes, defined as those occurring later than 7 days post injury, between the patients who received antibiotic therapy in the first 48 or 72 hours and those who did not (OR 0.82, 95% CI 0.43 – 1.98 at 48 hours; OR 1.29, 95% CI 0.63 – 2.64 at 72 hours). Similarly, no difference was observed in rates of late wound infection, bloodstream infection, and urinary tract infection between the two groups. There was no significant difference in length of stay, number of ICU days, and number of ventilator days between the groups.

Conclusions: Nearly all patients with severe burns are febrile within the first 48 – 72 hours post injury. However, on multivariate analysis, initiation of broad spectrum antibiotic therapy did not result in reduction of infectious complications, reduced number of ICU days, reduced LOS, or reduced duration of mechanical ventilation. Given concerns regarding antimicrobial stewardship and breeding of resistant organisms, as well as the concern for adverse reactions associated with antibiotic therapy, the decision to start antibiotics in the first 48 – 72 hours after injury should be carefully considered even in the face of early fevers.

Poster # 8

ASSOCIATION OF EARLY RESUSCITATION WITH 5% ALBUMIN SOLUTION AND LATE INFECTIOUS COMPLICATIONS IN PEDIATRIC SEVERE BURN PATIENTS

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Introduction: Early resuscitation of severe burn patients is challenging due to the extreme capillary disturbance and leakage of intravascular fluid into the interstitial space. This has resulted in interest in the use of colloidal products including albumin and fresh frozen plasma as primary resuscitation products in severe burn patients. This study sought to determine whether early administration of 5% albumin in severe burn patients resulted in improved outcomes.

Methods: Institutional IRB approval was obtained prior to the initiation of this study. A retrospective review (2009 - 2015) was performed of a single-institution prospectively-maintained burn registry. Patients < 18 years of age admitted with total body surface area (TBSA) thermal injury greater than 15% were included. Exclusion criteria included age > 18 years, death within 72 hours of admission, and concomitant non-burn traumatic injuries. Outcomes were compared between patients receiving 5% albumin as part of resuscitation in either bolus or continuous administration within the first 48 hours post-injury and those who receiving only crystalloid. All parametric data were examined using Student's t-test and non-parametric data were analyzed using Chi-squared testing. Multivariate analysis adjusting for TBSA, patient weight, and ED disposition (ICU versus routine floor) based on a priori hypotheses was performed for all outcomes in question.

Results: Fifty two patients met inclusion criteria. Median age was 4 years (IQR 2 – 11.8 years), with 75% male. Median TBSA was 21.6% (IQR 16 – 32.8%). 23% of patients received 5% albumin in either bolus or continuous administration within the first 48 hours of injury, and 29% within 72 hours of injury. Multivariate regression controlling for TBSA, body weight, and initial ED disposition (ICU versus floor bed) demonstrated no difference in escharotomy requirement, unplanned intubation, duration of mechanical ventilation, number of ICU days, or length of stay between those patients who received albumin and those who did not. However, a statistically significant difference was observed in rates of late infection between the groups, with those receiving albumin at higher risk of developing late bloodstream, wound, or urinary tract infections (OR 5.41, 95% CI 1.15 – 25.6 at 48 hours; OR 5.76, 95% CI 1.35 – 24.7 at 72 hours).

Conclusions: The administration of 5% albumin is associated with higher risk of late infectious complications than crystalloid alone without a concomitant improvement in duration of mechanical ventilation, ICU days, length of stay, escharotomy requirement, or late intubation requirement. While limited by retrospective nature and number of patients, this study does not support the use of 5% albumin as a resuscitative fluid in pediatric severe burn patients.

Poster # 9

THE IMPACT OF BURN SIZE AND OTHER FACTORS ON WOUND HEALING RATE

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Introduction: The ability to accurately track the progress of burn injuries is vital for effective burn management and to improve patient outcomes. In order to increase the accuracy of burn wound mappings, we developed a computer-based burn mapping program to document full- and partial-thickness burns and ongoing surgical treatment modalities. The goal of the present study was to characterize the impact of burn size and other factors on wound healing rates.

Methods: A retrospective analysis of data from patients admitted to our burn center between August 2009 and March 2015 was conducted. All adult (≥18 years old) patients with a burn size of at least 20% TBSA and at least three computer-based wound mappings were included in the analysis. The data from the mappings was used to calculate average healing rates.

Results: Data from 130 eligible patients was identified and analyzed. Median length of stay was 34.5 days (20 ICU days) and overall mortality was 31.5%. The number of available computer-based wound mappings per patient varied (range: 3-45, median: 7), in part because the burn size varied widely (range: 20-99 %TBSA, median: 32 %TBSA). Survivors healed (median 0.9 %TBSA/day) and non-survivors did not (median 0.0 %TBSA/day). Large burns (≥30 %TBSA) healed significantly slower (0.3±0.1 %TBSA/day) than smaller burns (0.9±0.2 %TBSA/day), and elderly patients (> 65 years old) healed significantly more slowly (0.2 %TBSA/day) than younger patients (18-39 years old, 0.9 %TBSA/day).

Conclusion: Here we provide, for the first time, quantifiable data to support the anecdotal concept that large burns heal more slowly than small burns as average wound healing rates were inversely correlated with burn size. Average healing rates were also inversely correlated with age. Further analysis of the existing dataset will evaluate the impact of treatments, burn location, and other factors on healing rates.

Poster # 10

MORTALITY, FASCIAL CLOSURE, AND THE INFLAMMATORY CASCADE: A PROSPECTIVE RANDOMIZED TRIAL COMPARING NEGATIVE PRESSURE WOUND THERAPY AND BARKER'S VACUUM PACK TECHNIQUE FOR ABBREVIATED TRAUMA LAPAROTOMY

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Introduction: Two recent studies (WJS 2013 and Ann Surg 2014) involving mixed cohorts of septic and trauma abbreviated laparotomy (AL) patients have reported higher fascial closure and lower mortality rates with ABThera TM negative pressure therapy system (NPT) vs Barker's vacuum-pack technique (BPT). Improved outcomes with NPT have been attributed to higher elimination of pro-inflammatory cytokines from peritoneal fluid. We pursued these questions further, eliminating potential confounders associated with a septic cohort by conducting this prospective randomized trial exclusively in trauma patients.

Methods: 40 trauma patients requiring AL were cluster randomized by on-call surgeon to NPT (n=20) or BPT (n=20). Primary outcomes were fascial closure and mortality rates. Secondary outcomes included MODS scores, incidence of infection, ventilator days, and volume of peritoneal fluid removed. Concentrations of 17 cytokines in peritoneal fluid and serum were determined.

Results: No significant differences between NPT and BPT were found with respect to age, gender, mechanism of injury, injury severity, or admission base deficit. There were no differences in mortality or fascial closure rates (p=0.99). NPT removed a larger volume of fluid (p=0.03) and resulted in lower levels of TNFα (p=0.006) and IL-1β (p=0.008) in the peritoneal fluid at 24 hours. Higher serum IL-6 was associated with penetrating trauma (p=0.004), intraabdominal abscess formation (p=0.03), and lower rates of fascial closure (p=0.03).

Conclusion: In this group of severely injured trauma patients, we observed no differences in mortality or fascial closure rates between the treatment groups; NPT and BPT were similarly efficacious in the management of the open abdomen. In the absence of differences in mortality or closure rates, the clinical significance of peritoneal fluid and cytokine clearance remains elusive. Measurement of baseline serum IL-6 in penetrating trauma patients may identify those most likely to develop intraabdominal abscesses and those who will go on to require staged abdominal wall reconstruction.

Poster # 11

IDARUCIZUMAB FOR REVERSAL OF THE ANTICOAGULANT EFFECTS OF DABIGATRAN IN THE TRAUMA SETTING: RE-VERSE AD INTERIM RESULTS

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Introduction: Idarucizumab, a recently approved humanized monoclonal antibody Fab fragment, specifically reverses dabigatran's anticoagulant effect. Here, we report an interim analysis of the subset of trauma patients with severe bleeding or requiring urgent surgery in the ongoing RE-VERSE AD study.

Methods: RE-VERSE AD is a, multinational, single cohort study investigating the safety and efficacy of 5g idarucizumab to reverse dabigatran in patients with life-threatening or uncontrolled bleeding or who require an emergency procedure with a need for hemostasis. Study endpoints include the maximum reversal of the anticoagulant effect of dabigatran in the first 4 hours (primary endpoint), based on diluted thrombin time (dTT) or ecarin clotting time (ECT), and assessments of clinical outcomes.

Results: All 18 trauma patients (10 with severe bleeding and 8 others requiring urgent surgery, age range 59-92 y) received 5g idarucizumab based on the treating clinician's impression that reversal was warranted; median time from last dabigatran dose to treatment was 16.1 hr. The injuries were 8 fractures (3 femoral neck, 2 femur, 1 hip-not specified, 1 ankle, 1 wrist) all requiring emergency surgery, 6 intracranial hemorrhages (4 subdural, 3 subarachnoid, 1 intracerebral), and 4 blunt traumas leading to major soft tissue bleeding (1 retroperitoneal, 2 intramuscular, 1 polytrauma). Median maximum percent reversal of anticoagulation was 100% (95% CI, 100–100) over 4 hours as assessed by dTT and ECT. Dabigatran plasma levels were below limit of quantification (BLQ) in all trauma patients at the end of second infusion and stayed BLQ for ≥12 hours. In the 8 patients undergoing surgery as the index inclusion criteria, intraoperative hemostasis was normal in 7 patients and mildly abnormal in 1 patient; median time to surgery was 3.9 hours (range: 0–23). Of the 10 cases with bleeding related to trauma, bleeding stopped in 5 patients; cessation of bleeding was not assessable in 4 patients and the information was missing for 1 patient. Four of these 10 patients proceeded into surgery/invasive procedures to further address the bleeding. One patient had deep vein thrombosis/pulmonary embolism 9 days post-idarucizumab, while not receiving anticoagulation. Median duration of hospitalization for all 18 patients was 15.5 days (range: 4–93); all survived to hospital discharge.

Conclusion: These preliminary results suggest that idarucizumab rapidly, completely and durably reverses dabigatran and facilitates the management of dabigatran-treated patients who present after serious trauma.

Poster # 12

IMPACT OF IMPLEMENTING AN ACUTE CARE SURGERY SERVICE ON OPERATING ROOM EFFICIENCY

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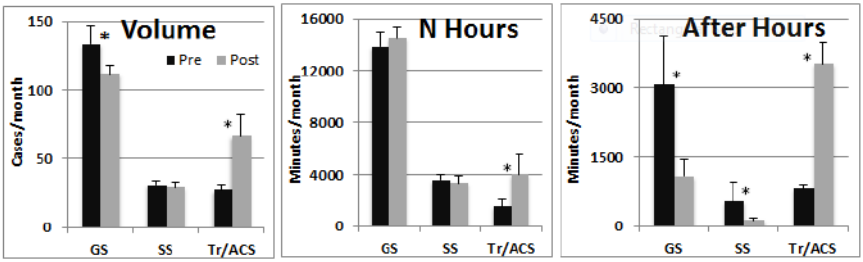
Introduction: The operating room (OR) is a resource intensive and high cost center within the hospital. The ready availability of a staffed OR and surgeon are essential for the effective functioning of an Acute Care Surgery (ACS) model of care. No study has evaluated the impact of adopting the ACS model on the efficiency of the OR. The current study tests the following hypothesis: adopting an ACS care delivery model will lead to 1. increased OR efficiency and 2. cost savings.

Methods: OR utilization metrics – case volume, group utilization, after-hours utilization, proportion of operative time in normal working hours – were obtained from the OR management database [WiseOR® (Palo Alto, CA)] 12 months before (Pre: Oct 2014-Sept 2015), and 5 months after (Post: Oct 2015-Feb 2016) ACS model implementation. Service utilization times for the services providing acute surgical care in the Pre period were compared to the ACS service in the Post period. All data was entered into Microsoft Excel (Redmond, WA) and analysis performed with Stata 13.1 (StataCorp LP, College Station, TX). Significant was set at $p < 0.05$.

Results: Pre ACS implementation, Trauma, General surgery (GS) and specialty surgery (SS) services provided care for the acute surgical patient (Trauma and Emergency General Surgery). Post implementation the integrated ACS service was the sole provider of such care.



Post ACS implemtation the volume of cases were higher for Tr/ACS and lower for GS ($p<0.05$ for both). Post implentation OR utilization in normal working hours increased for all services ($p<0.05$ for all) while after hours utilization decreased for GS and SS ($p<0.05$) and increased for Tr/ACS ($p<05$) - Figure. OR utilization efficiency (measured as proportion of total utilized time that was during normal business hours) improved for GS and SS from 83% to 93% ($p<0.05$).

Conclusion: Implementation of an integrated ACS service with ready availability of OR and surgeon leads to improved OR efficiency. By shifting OR utilization from the more expensive and variable cost after hours to fixed cost normal hours, significant cost saving are achieved.

Poster # 13

OUTCOMES OF COMPLICATED APPENDICITIS: IS CONSERVATIVE MANAGEMENT AS SMOOTH AS IT SEEMS?

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Introduction: Management of complicated appendicitis (perforation with abscess or phlegmon) remains controversial. Cases are often initially managed conservatively with antibiotics and percutaneous drainage of abscesses to decrease surgical morbidity of open operations and formal bowel resections associated with perforation. Some experts recommend interval appendectomy (IA) because it is curative and there is an increased association of malignancy seen in patients presenting with perforation. However, it is not clear that IA actually decreases surgical morbidity seen in patients managed operatively during initial admission for complicated appendicitis.

Methods: This is a single institution retrospective cohort study from January 1, 2007 through June 1, 2014 of patients diagnosed with acute appendicitis. Patients with complicated appendicitis based on imaging were grouped into immediate and interval management cohorts and surgical outcomes were analyzed. Multivariate logistic and linear regression models were developed to compare adjusted patient outcomes between study groups.

Results: During the study period 582 patients were diagnosed with appendicitis. Of these, 87 patients with complicated appendicitis underwent surgery and outcomes between immediate (n=64) versus interval groups (n=23) were compared. Similar rates of open appendectomies were found within each group with 34.4% in the immediate group and 30.4% in the interval group. Conversion rates were found to be higher in the immediate group, 23.8% versus 13.3%. However, 9 patients initially managed in an interval manner failed requiring early surgical intervention. Of this failure group, 5 required formal bowel resections compared to only one patient that required a formal bowel resection in the immediate group. Patients managed in an interval fashion on average required 3.48 office visits, 2.92 CT scans, and 19.2 days of antibiotics prior to definitive surgery.

Conclusion: Most studies finding increased surgical morbidity of complicated appendicitis managed operatively are compared to simple appendicitis. To our knowledge, this is the first study comparing complicated appendicitis managed during index admission to interval appendectomy. Overall, patients managed in an interval manner did not have decreased surgical morbidity and in fact had a higher incidence of formal bowel resections. As well, patients managed with IA had increased length of antibiotics, office visits and number of CT scans prior to surgery. Larger prospective studies are needed to further define which patients should be managed conservatively.

Poster # 14

LAPAROSCOPIC COMMON BILE DUCT EXPLORATION AND ACUTE CARE SURGERY: LIMITED EXPOSURE IN TEACHING HOSPITALS

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Introduction: Management of choledocholithiasis (CDCL) requires expertise in minimally invasive procedures like laparoscopic common bile duct exploration (LCBDE) or endoscopic retrograde cholangiopancreatography (ERCP). Both are technically challenging and their use depends on specialty availability and level of training received. Data is lacking on nationwide rates for treatment of CDCL based on location and teaching status, particularly in the acute care setting. We describe nationwide utilization of ERCP and LCBDE for CDCL presenting to the emergency department (ED), with sub-analysis of hospital teaching status and location.

Methods: The National Inpatient Sample (NIS) database was queried for all emergency admissions with a diagnosis of CDCL requiring laparoscopic cholecystectomy (LC) during the same hospital admission. Patients were included if they underwent either a LCBDE or ERCP. Hospital data was analyzed from 2010-2012. Our outcome measures included rates of ERCP and LCBDE based on teaching status, location (urban vs. rural), length of stay (LOS) and cost.

Results: A total of 12,691 patients with CDCL were identified, with the minority undergoing LCBDE (2.7%, n=272) vs. ERCP only. Both groups were similar in age, gender, race, and payer type. The LCBDE group had significantly shorter LOS (4.7 vs. 5.5 days, $p=0.002$) and lower total charges ($41,489 vs. $55,371, $p<0.001$) when compared to the ERCP group. Overall, LCBDEs were performed twice as much in non-teaching hospitals vs. teaching hospitals (1.8% vs. 0.9%, $p= 0.03$), however the procedure of choice for CDCL was ERCP (97.3% of cases). Urban hospitals performed the majority of LCBDEs (73.1% urban vs. 26.9% rural). Urban teaching facilities performed LCBDEs at lower rates compared to their non-teaching counterparts (2.2% vs. 3.1%, $p=0.038$).

Conclusion: LCBDE was associated with reduced LOS and cost compared to ERCP. LCBDE is less commonly performed in teaching hospitals, and the least frequently in rural settings suggesting potential limitations on training.

Poster # 15

APPENDICEAL MALIGNANCY PRESENTING IN PATIENTS WITH ACUTE APPENDICITIS: NOT A DISEASE OF THE ELDERLY

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Introduction Patients with a primary appendiceal malignancy (AM) often present with variable symptoms, including those of acute appendicitis (AA). Recent studies have demonstrated efficacy for treating patients with uncomplicated AA with antibiotics alone. However, with the incidence of AM increasing nearly two-fold over the past ten years, it is vital to identify characteristics of patients who present with AA, but ultimately have a primary AM. The purpose of this study is to identify characteristics and outcomes of patients diagnosed with a primary AM after treatment for AA.

Methods A retrospective review of a pathology database was performed identifying all patients who presented with AA and underwent surgical management between January 2000 and December 2010. Pathology reports were reviewed and patients with primary AM were identified.

Results Of the 2676 patients surgically treated for AA, 0.8% (n=24) had a primary AM. Patients with a primary AM had a mean age of 42±18.9 years. Patients were more likely to be Caucasian (84%, n=20) than African American (8%, n=2) or Hispanic (8%, n=2) and presented with an average white blood cell count of 11.2±4.0. Patients were more likely to have a carcinoid tumor (42%, n=10) or mucinous neoplasm (42%, n=10), followed by an adenocarcinoma (16%, n=4). A majority of patients required no further intervention after initial operation (80%, n=19). Only 20% (n=5) underwent subsequent right hemicolectomy, two of which were definitive. The remaining patients underwent chemotherapy (4%, n=2) or transitioned to palliative care (2%, n=1).

Conclusions Our data suggest that AM is not a disease exclusive to the elderly and shows that patients diagnosed with a primary AM after treatment for AA are between the ages of 17 and 60, Caucasian, present with a white blood cell count just above normal, and generally have an appendiceal carcinoid or mucinous neoplasm. Most patients were appropriately treated with their primary procedure, with a minority of patients requiring further surgical intervention or adjunct treatments, including chemotherapy or palliation. These findings suggest that acute care surgeons must be aware that every appendectomy is potentially an oncologic procedure.

Poster # 16

VALIDATION OF THE AMERICAN COLLEGE OF SURGEONS NSQIP SURGICAL RISK CALCULATOR IN EMERGENCY GENERAL SURGERY PATIENTS

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Introduction: The American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) Surgical Risk Calculator is a tool designed to estimate the chance of an unfavorable outcome after surgery. Although it is widely used, it still requires validation for individual patient populations. Our goal was to evaluate the accuracy of the risk calculator in our emergency general surgery (EGS) population.

Methods: Data were collected from our institutional NSQIP database from patients undergoing EGS procedures at a tertiary referral center over a 12-month period. The CPT code and patient risk factors were placed into the risk calculator and a predicted risk of complications was obtained. This was then compared to actual outcomes. For each patient, risk was calculated with adjustments 1-3 available within the calculator (1-no adjustment necessary, 2 -risk somewhat higher than estimate, 3-risk significantly higher than estimate). A p value of <0.05 was used to define statistical significance.

Results: From April 2014 to March 2015, 227 patients met inclusion criteria. Actual outcomes are compared to predicted outcomes using adjustments 1-3 (see Table 1 and 2). For all categories examined, the predicted risk with an adjustment of 1 was similar to the actual complication rate. In multiple categories a risk adjustment of 2 or 3 resulted in a predicted risk that was statistically significantly higher than actual patient outcomes.

Complication	Predicted ± SD	Actual	p value
Mortality		7.9%	
Adjustment 1	5.7 ±10.8%		0.17
Adjustment 2	8.5 ±11.8%		0.75
Adjustment 3	14.8 ±39.2%		0.0016
Return to OR		12.3%	
Adjustment 1	7.1 ±7.6%		0.82
Adjustment 2	8.4 ±8.9%		0.61
Adjustment 3	10.7 ±11.0%		0.10
Discharge to nursing home		12.3%	
Adjustment 1	14.8 ±24.3%		0.28
Adjustment 2	22.2 ±25.6%		0.0001
Adjustment 3	30.4 ±30.6%		<0.0001

Table 1: Mean predicted risk with standard deviation vs. actual risk for major complications

Complication	Predicted ± SD	Actual	p value
Pneumonia		3.5%	
Adjustment 1	3.4 ±4.8%		0.91
Adjustment 2	4.6 ±5.7%		0.0025
Adjustment 3	6.7 ±7.9%		<0.0001
Cardiac Complications			
Adjustment 1	2.0 ±3.0%	3.1%	0.28
Adjustment 2	2.9 ±3.5%		0.87
Adjustment 3	4.5 ±5.1%		0.27
Surgical Site Infection		6.6%	
Adjustment 1	5.4 ±5.5%		0.43
Adjustment 2	7.5 ±7.2%		0.60
Adjustment 3	9.7 ±9.1%		0.09

Table 2: Mean predicted risk with standard deviation vs. actual risk for individual complications

Conclusion: The ACS NSQIP Surgical Risk Calculator is valid in the EGS population. A risk adjustment of 1 was predictive of actual patient outcomes while risk adjustment of 2 or 3 frequently led to significant over-estimation of potential complication rates. These data support the use of this tool in the EGS population in patient care decisions as well as to inform conversations with patients and families about outcome expectations.

Poster # 17

VALIDATION OF AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA (AAST) GRADING SYSTEM TO MEASURE ANATOMIC DISEASE SEVERITY IN EMERGENCY SURGERY FOR ACUTE CHOLECYSTITIS

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Introduction: A uniform grading system for measuring anatomic severity of emergency general surgical diseases was developed by the AAST in an effort to achieve standardization for quality assurance, outcomes research and surgical training. To date, this grading system has not been validated and thus correlation of outcomes with anatomic severity is unknown. The aim of our study was to compare the morbidity and mortality of patients undergoing emergent laparoscopic cholecystectomy with disease severity as proposed by the AAST.

Methods: A retrospective review was conducted of all patients who underwent emergent laparoscopic cholecystectomy after presenting to the emergency department with acute cholecystitis from 2005-2015. Disease severity was categorized based on AAST grading scale (I-V) (Figure 1). Statistical comparisons were made between increase in severity within groups and worsening postoperative complications.

Results: A total of 237 patients, mean age 64.8 ± 17.5 years, underwent emergency laparoscopic cholecystectomy during the study period. The majority were males (n=134, 56.5%, white (n=214, 90.3%) and had previous abdominal surgery (n=122, 51.5%). The most common comorbidity included obesity (n=72, 30.4%), coronary artery disease (n=44, 18.6%) and diabetes (n=40, 16.9%). A total of 28 patients (11.8%) were converted to open and 70 (29.5%) had postoperative complications. Patients in each grading category of AAST were as follows: Grade I (n=196, 82.7%), Grade II (n=37, 15.6%), Grade III (n=3, 1.3%), Grade IV (n=1, 0.4%), Grade V (n=0, 0%). Patients with increasing grade were more likely to present with septic shock (p=0.002), develop postoperative complication (p=0.035) and have increased length of stay (p=0.010). There was no association with iatrogenic biliary injury (p=0.143), reoperations (p=0.955) and 30 day mortality (p=0.860).

Conclusion: Using the AAST grading system, increasing disease severity predicts postoperative complications but not mortality in this series. The paucity of patients in Grade III-V may necessitate re-alignment of the anatomic descriptions to form a more reproducible predictive model.

Poster # 18

LAPAROSCOPIC FENESTRATING SUBTOTAL CHOLECYSTECTOMY: A SAFE APPROACH TO THE DIFFICULT GALLBLADDER.

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Introduction: Biliary system injury at the time of laparoscopic cholecystectomy (LC) is known to occur when operative intervention is complicated by severe local inflammation. To mitigate such risks, partial cholecystectomy has long been described as an acceptable open approach and has been applied as a viable laparoscopic technique. Different management options for the portion of the gallbladder that is left in situ, most notably fenestrating versus reconstituting subtypes, have recently been defined. Individual subtype results, however, remain unclear. We describe the experience of an acute care surgery service at a tertiary referral center with numerous successful applications of laparoscopic fenestrating subtotal cholecystectomy (LFSC) when a critical view of safety could not be obtained.

Methods: During a thirty month period during 2013-2016, our mixed acute care surgery and trauma service operatively managed patients with acute gallbladder pathology, primary with a laparoscopic modality. Of these patients, several were treated with a LFSC technique including removal of the peritoneal portion of the gallbladder and expressed stones, as well as placement of a closed-suction drain. We observed for duration of drain requirements, persistence of biliary fistula, further operative or endoscopic intervention requirements, as well as open conversion rates. Length of stay (LOS) was also compared between LC, LFSC, and open conversion.

Results: Of 155 patients who were operatively managed after non-elective consultation, 17 patients underwent LFSC. Additionally, 4 patients required open conversion (2.5%). Of the 17 patients managed with LFSC, the median age was 42 (range 21-66) with 9 males and 8 females. The operative diagnosis of the LFSC patients was acute cholecystitis for 11 patients, gangrenous cholecystitis for 4 patients, and chronic cholecystitis for 2 patients. LOS following LFSC was a median of 3 days (range 2-5) as compared to LOS of 1 day (range 0-10) for LC and 6 days (range 2-7) for open conversion. Post-operative requirement for ERCP was noted in 2 patients for high biliary output. The duration of closed-suction drain requirements for LFSC was a median of 18 days (range of 13-40.) There were no extra-cystic biliary injuries for any patient noted.

Conclusion: When a critical view of safety is not able to be obtained, our experience shows that a fenestrated technique for subtotal cholecystectomy is a viable option for difficult gallbladders and may be considered as an alternative to open conversion.

Poster # 19

PROLONGED PREOPERATIVE LENGTH OF STAY IS ASSOCIATED WITH PROLONGED POSTOPERATIVE LENGTH OF STAY IN CHOLECYSTECTOMY FOR ACUTE CHOLECYSTITIS

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Introduction: In the past two decades there has been considerable research assessing optimal timing of cholecystectomy in acute cholecystitis (AC) to reduce intraoperative complications. Few studies have assessed the impact of delayed operative management on overall length of hospital stay. We hypothesized that prolonged preoperative length of stay (preLOS) would be associated with prolonged postoperative length of stay (postLOS) in patients with AC undergoing laparoscopic cholecystectomy (LC) in the absence of other complicating factors. Secondary outcomes included rate of LC to open cholecystectomy (OC) conversion, discharge to continued care facility, 30-day readmission, and the association between preLOS and day of the week admission.

Methods: We reviewed 715 consecutive patients who underwent cholecystectomy. To capture patients who were primarily admitted and treated for AC, we excluded patients with additional final hospital diagnoses and those who underwent additional preoperative or postoperative procedures. Patients who underwent planned OC were also excluded. GraphPad software was used for statistical analysis ($p<0.05$ considered significant).

Results: 394 of 715 patients had both a diagnosis of AC and underwent only cholecystectomy. 374 underwent LC alone.

	Preoperative Length of Stay (days)		
	1-2	3-4	>4
LC to OC Conversion	3.6%	7.5%	21.1%
PostLOS (days)*	1.34	1.88	2.72
Discharge to Facility*	2.0%	9.7%	40.0%
30-day Readmission*	4.4%	9.7%	14.3%

p<0.01 for all rows, *LC patients only

In LC alone, procedure duration average was 74.7 minutes and did not vary significantly by preLOS ($p=0.89$). Average preLOS was 1.19 days vs 1.71 days for Monday and Tuesday admission vs. Friday, Saturday, and Sunday ($p<0.01$).

Conclusion: Prolonged preoperative length of hospital stay in patients undergoing laparoscopic cholecystectomy for acute cholecystitis is associated with prolonged postoperative length of stay, increased rate of conversion to open, transfer to a continued care facility, and 30-day readmission. Weekend admission is associated with a longer preoperative time compared to early week admission.

Poster # 20

TRANSFER STATUS: A SIGNIFICANT RISK FACTOR FOR MORTALITY IN PATIENTS REQUIRING EMERGENT COLON SURGERY

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Introduction: Patients with time-sensitive surgical diagnoses benefit from early surgical source control. Since transfer from outside facilities can delay definitive treatment, we investigated the influence of transfer status on the postoperative mortality in patients requiring emergent colon surgery.

Methods: Emergent open and laparoscopic colon resections were identified in the American College of Surgeons National Surgical Quality Improvement Program datasets for 2010 to 2012. Four groups were identified by location and timeliness of transfer: home, outside emergency department (ED), outside hospital ward, or nursing home / chronic care facility. Thirty-day survival was analyzed by Kaplan-Meier method, including multivariable Cox regression analyses.

Results: A total of 13,967 patients were identified. Thirty-day mortality varied significantly ($p<0.0001$) among the four groups; increasing timeliness of transfer had increasing probabilities of survival ($p<0.0001$). Hazard ratios indicated that, compared to patients presenting from home, the relative risk of death after transfer from outside ED was 1.38 ($p<0.0001$), after transfer from outside hospital ward was 1.54 ($p<0.0001$), and after transfer from nursing home or chronic care facility was 2.15 ($p<0.0001$). Patients transferred from a nursing home or chronic care facility were more likely to have septic shock ($p<0.0001$) or an American Society of Anesthesiology (ASA) Score of 4 ($p<0.0001$) or 5 ($p<0.0001$).

Conclusion: Transfer status is an independent contributor to death in emergency general surgery patients undergoing colon resection. Those patients emergently taken to the operating room after transfer from a nursing home or chronic care facility have the poorest outcomes, partially due to increased physiologic decompensation and poorer physical status. These results reinforce the importance of timely surgical evaluation and intervention, and suggest a potential role for more rapid transfer and improved triage in patients requiring emergency surgery.

Poster # 21

FAILURE TO RESCUE: DISPARITIES INFLUENCE OUTCOMES IN PATIENTS WITH NECROTIZING SOFT TISSUE INFECTIONS

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Introduction: Necrotizing soft tissue infection (NSTI) is a rare but morbid and potentially life-threatening disease. Because of the progressive nature of NSTI, patients often require referral to tertiary care centers for definitive treatment. Racial, socioeconomic, and gender disparities in healthcare and outcomes for septic patients are well known. The objective of this study was to evaluate the impact of hospital characteristics on mortality disparities among patients with NSTI.

Methods: Patients 18-65 years old hospitalized with NSTI, defined by the ICD-9 codes for necrotizing fasciitis, gas gangrene or Fournier's gangrene were identified in the Nationwide Inpatient Sample Database from 1996-2012. Patient factors studied included demographics, insurance, shock, and Charlson comorbidity index (CCI). Other factors studied included inter-facility transfers, weekend admissions and teaching hospital status. Univariate, bivariate and multivariate logistic regressions were performed to characterize the influence of Teaching (TH) and non-Teaching hospitals (nTH) on disparities in mortality for patients with NSTI.

Results: There were 31,072 patients with NSTI identified. The mean age was 45 years and 32% were female. TH accounted for 54.3% of all admissions. TH vs nTH patient populations were significantly different in racial distribution, insurance types, as well as the proportion of patients with shock (16% vs 13%, $p<0.001$). Inter-facility transfers occurred in 11.5% of admissions, with significantly more transfers into TH 69% ($p<0.001$). TH also had more inter-facility transfers on the weekend compared to nTH (22% vs 13%, $p<0.001$).

Overall mortality was 9.5%. Mortality was higher at TH than nTH (11% vs 8%, $p<0.001$). Independent predictors of death included female gender, Hispanic race, higher CCI and having Medicare or Medicaid as insurance (OR 1.3 $p<0.001$, OR 1.1 $p=0.038$, OR 2.2 $p<0.001$ & OR 1.6 $p<0.001$ respectively). Additionally, inter-facility transfers, weekend admissions and TH had a higher risk of death (OR 1.3 $p<0.001$, OR 1.1 $p=0.017$ & OR 1.4 $p<0.001$ respectively).

The highest risk of death was associated with shock (OR 4.7 $p<0.001$). Patients in shock were more likely to be transferred, and more likely to be transferred to a TH (OR 1.4, $p=0.003$), be admitted on the weekend (OR 1.3, $p=0.033$), and be uninsured (OR 1.5, $p=0.014$). On subgroup analysis, patients in shock had an increased risk of death at both TH and nTH, though this risk was less pronounced at THs (OR 4.2 vs. OR 5.5, $p<0.001$).

Conclusion: Disparities exist in the inter-facility transfer patterns of teaching and non-teaching hospitals that influence outcomes for patients with NSTI. Insurance status may influence timely access to optimal care resulting in failure to rescue patients.

Poster # 22

SAFETY OF EARLY TRACHESOTOMY IN TRAUMA PATIENTS AFTER ANTERIOR CERVICAL FUSION

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Introduction: Cervical spine injuries (CSI) have major effects on the respiratory system and carry high incidence of pulmonary complications. Early tracheostomy and ventilator support are often indicated in patients with CSI. However, in patients with anterior cervical fusion (ACF) concerns about cross contamination often delay tracheostomy placement. This study aims to demonstrate the safety of early tracheostomy within four days of ACF.

Methods: Retrospective chart review was performed of all trauma patients admitted to our institution between 2001-2015 with diagnosis of CSI who required both ACF +/-posterior cervical fusion (PCF) and tracheostomy during the same hospitalization. 39 study patients with early tracheostomy (1-4 days after ACF) were compared to 59 control patients with late tracheostomy (5-21 days after ACF). There was no difference in age, sex, preexisting conditions, trauma and CSI severity scores between both groups. Univariate and logistic regression analyses were performed to compare risk of pneumonia, wound infection and sepsis between both groups during the hospital stay.

Results: There was no difference in pneumonia, wound infection and sepsis between both groups: among the 39 patients with early tracheostomy, 14 had pneumonia (36%) compared to 20 of the 59 patients (34%) with late tracheostomy ($p=0.84$, Chi Square). Two of the 39 early tracheostomy patients (5%) had sepsis compared to 10 of the 59 (17%) late tracheostomy patients ($p=0.12$). There were no cases of cervical fusion wound infection in the early tracheostomy group (0%), but 5 cases (8.47%) in the late tracheostomy group ($p=0.15$), four of which involved the PCF wound and one ACF wound. There was no difference in ICU stay ($p=0.2$), hospital stay ($p=0.23$) and mortality ($p=0.06$) between groups.

Conclusion: Early tracheostomy within 1-4 days after ACF is safe without increased risk of infection compared to later tracheostomy.

Poster # 23

ACUTE CARE SURGERY: TRAUMA, CRITICAL CARE, EGS.....AND PREVENTATIVE HEALTH?

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Introduction: Acute care surgeons routinely care for a unique set of patients who may have limited access to the healthcare system outside of emergency encounters. These patients may not participate in typical preventative screenings/interventions (PSI's) such as mammography (MO), colonoscopy (CO), or pneumococcal vaccinations (VA). We sought to investigate the compliance rate with nationally established PSI's at our urban Level I trauma center, identify any related barriers, and determine if acute care surgeons have an opportunity to facilitate improved compliance in this patient population.

Methods: Over a six month period, all patients evaluated by the acute care surgery service were prospectively enrolled after informed consent. A single patient could be enrolled into each arm (MO, CO, VA) based on PSI recommendations. Patients were screened to assess their compliance and identify barriers to participation. Screening parameters included variables such as: insurance status, highest level of education, primary language, and primary care physician status. For those patients who were not in compliance with PSI recommendations, we developed a PSI bundle (PSIB) to be administered after completion of the screening. The PSIB included an educational component, followed by an interventional component. The intervention consisted of same stay administration of the pneumococcal vaccine, and scheduling of indicated MO and CO regardless of insurance status. Final compliance was assessed with a follow-up phone call.

Results: During the study period, 90 patients were enrolled into each study arm. Individually, the initial compliance rate for MO, CO, and VA were 63%, 58%, and 67% respectively. Patients without a primary care physician had a compliance rate of 32%. The most commonly cited reason for non-compliance was lack of knowledge of the PSI recommendations (41%). Cost was not a significant barrier (16%). Males were twice as likely to be noncompliant when compared to females. Post PSIB scheduling compliance for MO was 85%, for CO 80%, and 100% of patients received their VA during the index admission. Final (actual) compliance at follow-up for MO was 72%, for CO 68%, and 100% for VA.

Conclusion: At our urban Level I trauma center, acute care surgeons evaluate a large number of general surgery and trauma patients. These patients frequently only access the healthcare system for emergencies, do not have primary care physicians, and are non-compliant with or unaware of national PSI recommendations. The acute care surgeon-patient interaction represents a valuable opportunity for education and improved PSI compliance. Our PSIB resulted in improved PSI compliance in all 3 categories. Additional research should focus on developing effective interventional strategies and evaluating their impact on patient outcomes.

Poster # 24

THE DEAD BOWEL CONSULT: WHAT DOES THE LACTATE LEVEL TELL US?

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Introduction: Accurate identification of patients with bowel ischemia remains a challenge. Previous studies have confirmed the limited value of serum lactate in securing the diagnosis, but have not fully assessed the potential value in lactate trends. The purpose of this study was to identify predictive laboratory findings for ischemic bowel. Since ischemic bowel (IB) likely serves as a site of ongoing lactic acid production, it was hypothesized that a falling lactate level would be rare in the presence of bowel ischemia

Methods: Billing records in a single large urban hospital were used to retrospectively identify patients with ICD codes for mesenteric ischemia, including patients with proven mechanical and non-mechanical gut ischemia, and patients who received surgical consultation for concern of ischemia. History, clinical exam, and imaging findings were documented. Serum lactate, pH, WBC, and base deficit were recorded for 24 hours before and after the time of consultation. Mean and peak serum lactate levels were recorded, and lactate levels were dichotomized to down-trending vs. stable/rising prior to any surgical intervention. Two-sample t-tests or non-parametric rank tests were used to test the differences in the laboratory measurements between patients who were confirmed to have IB and those who did not have IB. A p-value <0.05 was considered statistically significant.

Results: 165 patients met inclusion criteria. 62% had dead bowel confirmed at laparotomy, on surgical pathology, or at autopsy. Mean age was 64.3 years. 43% were male and 57% were female. 20% had dead bowel from a mechanical cause such as bowel obstruction or volvulus. There were no differences between mean (4.6±4.0 vs. 4.1±3.3 mmol/L) or peak (6.7±5.7 vs. 6.2±5.2 mmol/L) lactate levels between patients who did and did not have IB. 80% of patients with IB had stable/rising lactate levels, compared to 59% of patients without IB (p=0.0082). Patients with ischemic bowel were more likely have a lower mean pH (7.31 vs 7.36, p=0.003), minimum pH (7.21 vs 7.27, p=0.013), and mean base deficit (-6.81±4.76 vs -4.87±5.63, p=0.03) than those without. There were no significant differences in mean or maximum white blood cell count between the groups.

Conclusion: While it is somewhat uncommon for lactate levels to fall in the presence of ongoing bowel ischemia, 20% of patients with IB had downtrending lactic acid levels. Clinicians concerned about bowel ischemia should not be reassured by falling lactate levels.

Poster # 25

Higher Body Mass Index (BMI) and Low-Volume Surgeons Confer an Increased Risk of Operative Complications in Anterior Spinal Exposures

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Introduction: Anterior spinal exposures performed by spine or vascular surgeons have a known complication rate of 2-11%. We present the largest single institution experience of anterior spinal exposures performed by acute care surgeons. The goal of this study was to identify factors contributing to operative complications during the exposure. We hypothesized that low-volume surgeons and patients with a BMI >30 would have an increased complication rate.

Methods: All consecutive patients who underwent an anterior spinal exposure (thoracic or lumbar) by one of our six acute care surgeons over a five-year period were included in this study. Demographics including indication for surgery, history of previous spinal surgery, age, gender and BMI were collected. Operative reports were reviewed for all intraoperative complications. Outcomes including return to OR, hospital and intensive care unit length of stay (LOS), 30-day mortality and re-admission were recorded. Outcomes were analyzed using a Student's t-test with $\alpha = 0.05$ in GraphPad Prism version 5.00 (GraphPad Software, San Diego CA).

Results: In total 1170 patients underwent an anterior spinal exposure during the study period. Average BMI for the study population was 29.0 + 6.3.Three of the surgeons each performed at least 45 exposures per year and had individual experiences of 250 or more cases. The remaining three surgeons had performed less than 20 cases each over the five-year study period.
There were fifty-four major complications recorded: 41 vascular injuries, 10 returns to the operating room for bleeding and 3 visceral injuries including two ureteral injuries and one lung laceration.
Patients who experienced vascular complications tended to have a higher BMI (31.2 + 7 versus 28.9 +6.3, p=0.02). Low-volume surgeons had a higher rate of operative complications than high-volume surgeons (21.6% + 4.8% versus 8.7% + 3.8%, p=0.04). Age, gender, indication for procedure and previous history of spinal surgery did not confer a greater risk of operative complications according to our findings.

Conclusions: In this, the largest single institution experience of anterior spinal exposures performed entirely by acute care surgeons we demonstrate an overall complication rate of 3.5%, comparable to the published rate by spine or vascular surgeons. Obesity (BMI >30) appears to confer a slightly higher risk for vascular injury. The overall risk of all operative complications increases when the exposure is performed by less experienced surgeons. We recommend exposures be performed by a dedicated cadre of experienced acute care surgeons. Further study is required to determine the minimum number of mentored cases required before surgeons can achieve acceptably low complication rates.

Poster # 26

INTRAABDOMINAL HYPERTENSION IS MORE COMMON THAN PREVIOUSLY THOUGHT: A PROSPECTIVE STUDY IN A MIXED MEDICAL-SURGICAL INTENSIVE CARE UNIT

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Introduction: Intra-abdominal hypertension (IAH) is an under recognized phenomenon in critically ill patients. The true incidence has not been adequately determined by well powered, prospective studies which adhere to modern consensus definitions.

Methods: A prospective observational study of consecutive ICU patients admitted to a mixed medical-surgical ICU. Intra-abdominal pressures were measured twice daily using the modified Kron technique and were continued until discharge, death or removal of the indwelling catheter. IAH was defined according to published guidelines as a sustained intra-abdominal pressure > 12 mmHg. Multivariable analysis was used to identify risk factors associated with IAH and ICU mortality.

Results: 286 patients met our inclusion criteria. Thirty percent of patients had IAH on admission and a further 15% developed IAH during their ICU stay. The incidence of abdominal compartment syndrome (ACS) was 3.0%. Obesity, sepsis, mechanical ventilation and 24-hour fluid balance (>3 L) were all independent predictors for IAH. IAH occurred in 28% of non-ventilated patients. Admission type (medical vs. surgical vs. trauma) was not a significant predictor of IAH. ICU mortality was 20% and was significantly higher for patients with IAH (30%) compared to patients without IAH (11%). IAH of any grade was an independent predictor of mortality (OR 2.8; 95% CI 1.2-6.2).

Conclusion: IAH is common in both surgical and non-surgical patients in the intensive care setting and in this study, was found to be independently associated with mortality. Despite prior reports to the contrary, IAH develops in non-ventilated patients and in patients who do not have IAH on admission. Intra-abdominal pressure monitoring is inexpensive, provides valuable clinical information, and should be routinely performed in the ICU. Future work should evaluate the impact of early intervention for patients with IAH.

Poster # 27

RED CELL DISTRIBUTION WIDTH PREDICTING TRAUMA MORTALITY IS INDEPENDENT OF SEVERITY OF INJURY

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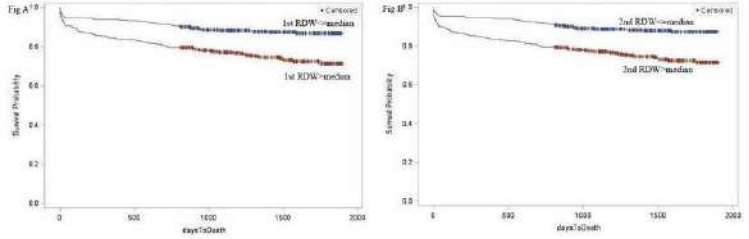
Introduction: Red blood cell distribution width (RDW), a component of the complete blood count, has been shown to be related to mortality in trauma. This correlation is not fully understood. The primary aim of this study was to determine if RDW prediction of mortality is trauma related or underlying health related. The secondary aim was to determine if the 2 nd RDW, drawn within ½ - 4 hours after the initial 1st RDW, is more predictive of mortality than the 1st RDW.

Methods: Data on all 919 trauma patients who had a 2nd RDW and were admitted to our trauma center from 8/2010 to 9/2013 were evaluated. Mortality data was obtained from the electronic medical record and Social Security Administration. The RDW was categorized by their medians (≥ vs < median).

Results: The 1st RDW was predictive of 1-year post-trauma all-cause mortality (OR=2.756, 95% CI: 1.757-4.323, $p<0.0001$), but not the 30-day mortality (OR=1.674, 95% CI: 0.982-2.854, $p=0.056$). The 2nd RDW was a predictor for either 30 day (OR=2.230, 95% CI: 1.348-4.028, $p=0.0019$) or 1-year mortality (OR=3.073, 95% CI: 1.959-4.822, $p<0.0001$). Both RDWs were associated with the age ($p<0.0001$) but not with ISS and hospital LOS. In multivariate logistic regression model, adjusted for age, sex, ISS and hospital stay, both RDWs were significant predictors of 1 year mortality ($p=0.0015$ for the 1st and 0.0006 for the 2nd), but not the 30-day mortality. In the Kaplan-Meier curve, both RDWs were significant predictors of the time to death ($p<0.0001$ for both) (Figures A and B). Paired student's *t*-test showed the 2nd RDW was significantly higher than the 1 st RDW ($p<0.0001$).

Conclusion: Our study demonstrated that RDW predicts all-cause trauma mortality but is independent of the severity of injury. RDW is a strong predictor for 1- year all-cause mortality, but not of 30-day mortality. RDW may be a good indicator of underlying health status and be clinically useful for long term prognosis after trauma. The 2nd RDW is most likely more reflective of the host physiological changes after body equilibrium. Further study investigating the relationship between RDW and outcomes is warranted.



Poster # 28

THE EPIDEMIOLOGY OF CHRONIC CRITICAL ILLNESS AFTER SEPSIS IN TRAUMA AND SURGICAL INTENSIVE CARE UNITS.

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Introduction: While inpatient mortality continues to decline after sepsis, those that previously died from early MOF now survive to a state of chronic critical illness (CCI), with persistent organ dysfunction, and poor long-term outcomes. We sought to define the epidemiology of CCI after sepsis in critically ill surgical patients.

Methods: This is a single center, prospective observational cohort study of trauma/surgical ICU patients treated for sepsis. Patients were screened and resuscitated via clinical decision support driven sepsis protocols. We compared risk factors and outcomes of septic patients who did, and did not develop CCI.

Results: Over 48 months, 147 surgical ICU patients with sepsis were enrolled in this cohort. Overall, septic patients were elderly (median age 62 yrs, IQR 53-70), had significant early physiologic derangement (median APACHE II score 22, IQR 15-26) and a prolonged hospital LOS (median 17 days, IQR 8-32). Illness severity was stratified as sepsis (n=28, 19%), severe sepsis (n=60, 41%) and septic shock (n=59, 40%) respectively, based on consensus criteria. Intra-abdominal sepsis was the primary infectious source (n=53, 36%) followed by pneumonia (n=25, 17%) and bacteremia (n=18, 12%). Overall inpatient mortality was 13%. Of those surviving ≥14 days, 47 (35%) developed CCI. As compared to those discharged from the ICU by day 14, septic patients that developed CCI had a significantly higher rate of "poor" hospital disposition (Long term acute care facility, Skilled nursing facility, hospice or inpatient death; 79 vs. 40%, $p<0.0001$). Multivariate analysis revealed severe sepsis/septic shock (OR 7.9, 95% CI 1.5-43.3), baseline low albumin (OR 4.6, 95% CI 1.5-13.9), and baseline elevated bilirubin (OR 2.1, 95% CI 1.3-3.3) as the only significant independent early (<24 hrs.) predictors of developing CCI.

Conclusion: While inpatient mortality rates continue to decrease, CCI is a common outcome after sepsis in critically ill surgical patients and is associated with discharge dispositions associated with poor long-term outcomes. Severity of the initial physiologic response to infection is the primary clinical predictor of development of CCI. Early clinical risk factors commonly associated with sepsis mortality, including age and comorbidities do not appear to be predictive of this morbid phenotype.

Poster # 29

Echocardiographic Correlates Associated with in-hospital Mortality in a Cohort of Trauma and Burn Patients

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Introduction: Hemodynamic Trans Esophageal Echocardiography (hTEE) is being used more frequently by trauma surgeons for rapid evaluation of cardiac function and adequacy of volume resuscitation. hTEE is less invasive than intravascular monitors and has been studied in other patient populations and found to have similar accuracy in measuring cardiac preload, left ventricular stoke volume and left ventricular ejection fraction. We sought to identify the relationship between hTEE findings and outcome.

Methods: Medical records of 93 trauma/ burn patients who underwent hTEE and were admitted to a Level 1 trauma center between July 2013 and June 2015 were reviewed. Left ventricular fractional area of change (LV FAC) was used as a surrogate of LV systolic function (cut-off= 40%). LV end diastolic area (EDA) (cut-off=10 cm2) was used as a surrogate of volume resuscitation. In separate analyses, demographic, clinical, and injury characteristics were compared between a) patients with low FAC (i.e., EF < 40%) versus normal FAC (i.e., ≥40%) and b) among patients with a normal EF, those who had a low EDA (i.e., <10) and a normal EDA using a t-test and Fisher's exact test for continuous and categorical variables, respectively. Cox regression analysis was used to calculate the association between EDA and death.

Results: The mean injury severity score among all patients was 23. There was no difference in outcome between those with low and normal FAC among all patients. Those with low FAC had higher systolic blood pressure at admission (p=0.0243) and higher serum lactate levels directly prior to the echocardiographic exam (p=0.0005). Among patients with normal FAC, those with low EDA had higher serum lactate levels directly prior to echocardiographic exam (p=0.0076) and were less likely to be male (p=0.0303). Among those with normal FAC, those with low EDA were over 3 times as likely to die (RR 3.33, 95% CI 1.37-8.08), this association remained significant after adjustment for serum lactate at echocardiography (RR 3.79, 95% CI 1.25-11.53).

Conclusion: Systolic dysfunction as evidenced by low FAC is associated with high serum lactate. In patients with normal systolic function, under-resuscitation as evidenced by low LV EDA is an independent predictor of in-hospital mortality. Echocardiography is a valuable tool in hemodynamic evaluation of trauma/ burn patients.

Poster # 30

THE LOW MOLECULAR WEIGHT FRACTION OF HUMAN SERUM ALBUMIN AS A POTENTIAL THERAPEUTIC FOR INFLAMMATORY CONDITIONS DUE TO ITS ROLE IN THE COX2 PATHWAY

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Introduction: The ability to decrease inflammation and promote healing is important for a variety of disease states, including the local inflammation observed after acute or sustained physical trauma as well as that documented in systemic inflammatory response syndrome (SIRS). Cyclooxygenase 2 (COX2) has an established role in inflammation, and while it is generally thought of as a pro-inflammatory molecule, COX2 has also been shown to be critical to the resolution and healing that occurs after the initial phase of the immune response. In this study, we investigated the effects of the low molecular weight fraction of human serum albumin (LMWF-5A), an agent that has proven to decrease pain and inflammation in osteoarthritis patients, on the expression of members of the COX2 pathway and its downstream products, prostaglandins (PGs).

Methods: Primary synovial fibroblasts were treated with LMWF-5A or saline as a control with or without the addition of cytokine (IL-1β or TNFα) to elicit an inflammatory response. The cells were harvested for RNA and protein at 2, 4, 8, 12, and 24 h, and their media was collected at 24 h for the analysis of secreted products. *COX2* mRNA expression was determined by qPCR, and COX2 protein expression was determined by western blot analysis. The levels of prostaglandin E2 (PGE2) and prostaglandin D2 (PGD2) in the media were quantified by competitive ELISA.

Results: In the presence of cytokine, LMWF-5A increased the expression of both *COX2* mRNA and COX2 protein, and this increase was significant compared to that observed with cytokine alone. Finally, the levels of PGE2 were increased only in TNFα-stimulated cells; however, in both IL-1β- and TNFα-stimulated cells, LMWF-5A increased the release of the anti-inflammatory PGD2.

Conclusion: The addition of LMWF-5A changes COX2 expression and the downstream effects of the COX2 pathway under inflammatory conditions. Specifically, LMWF-5A appears to trigger increased anti-inflammatory PG signaling. Thus, LMWF-5A could be used as putative therapeutic for a number of inflammatory conditions via its action on the COX2 pathway. For instance, it could be used injected locally or intravenously following trauma to ameliorate the induced immune response.

Poster # 31

ELIMINATION OF THE POST PROCEDURE CHEST X RAY USING ULTRASOUND AFTER CENTRAL LINE PLACEMENT

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Introduction: Routine chest radiography following central venous catheterization (CVC) is considered the standard of care. The purpose of this practice is twofold: 1) to identify pneumothorax (PTX), and 2) to rule out catheter malposition by verifying placement in the central venous circulation. This study investigates the utility of ultrasound (US), as compared to chest radiography (CXR), in addressing these two questions.
Methods: All patients, both trauma and surgical critical care, who underwent subclavian (SC) or internal jugular (IJ) CVC in the trauma intensive care unit at our level one trauma center, between the dates of 5/27/2015 and 2/29/2016, were included. These patients underwent surgeon – performed US examination, with instillation of 10mL of saline flush through the distal port of the catheter, immediately after catheter placement. Catheter malposition was ruled out with immediate (<1 second delay) visualization of turbulent flow into the right heart on parasternal or subxiphoid view. Catheter malposition was suspected if nonvisualization of turbulent flow, or delayed visualization of turbulent flow (>1 second), was noted. Ultrasound examination for PTX was then performed in three sites bilaterally using B mode imaging. CXR was obtained on all patients for comparison. Data were prospectively collected in a database. Retrospective analysis was performed to compare US examination to CXR for both line positioning and pneumothorax.
Results: 144 central venous catheterizations and subsequent ultrasound examinations were performed on 129 patients. One iatrogenic PTX (0.6%) was noted on CXR, and this was also noted on US. This iatrogenic pneumothorax was treated with tube thoracostomy prior to the CXR images being made available for viewing. Including pre-existing traumatic pneumothoraces, a total of six PTX were noted on CXR. All were also noted on US. Six malpositioned lines (4.1%) were noted on CXR, all of which were noted on US. The sensitivity and specificity for US examination for PTX, as compared to CXR, were both 100%. In patients with adequate acoustic windows, the sensitivity and specificity for US verification of catheter placement in the central circulation, as compared with CXR, was 100%. In one patient, who underwent two CVC's, the US examination for catheter position was inadequate due to poor acoustic windows and inability to adequately image the right heart.
Conclusion: Our data suggest that the elimination of routine CXR following CVC, instead performing US examination to assess for catheter position and pneumothorax, is safe. Use of routine US examination, rather than CXR, potentially decreases delays to use of the CVC while eliminating the costs associated with performance of CXR. While additional studies are needed to prove external validity, this study supports the replacement of routine CXR with routine US examination following central venous catheter placement.

	PTX on CXR	No PTX on CXR
PTX on US	6	0
No PTX on US	138	138

	CVC Malposition on CXR	No CVC Malposition on CXR
CVC Malposition on US	6	0
No CVC Malposition on US	138	138

Poster # 32

MILD TO MODERATE TO SEVERE: WHAT DRIVES PROGRESSION OF SEVERITY OF ARDS IN TRAUMA PATIENTS?

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Introduction: Acute respiratory distress syndrome (ARDS) is a complex lung inflammatory process with multifactorial etiologies. Risk factors for the development of ARDS, as defined by the American-European consensus conference, have been extensively studied. However, risk factors associated with the progression of severity of ARDS, as defined by the Berlin criteria (PaO2:FiO2 [P:F] ratio < 300), are poorly understood.

Methods: A retrospective chart and trauma registry review identified trauma patients admitted to our surgical intensive care unit who developed ARDS within a 5-year period (2010-2015). ARDS was defined according to the Berlin definition. The primary outcome was development of mild (P:F<300), moderate (P:F<200) or severe (P:F<100) ARDS. A logistic regression model was then used to identify risk factors associated with developing ARDS as well as progression of severity of ARDS.

Results: Of 2704 trauma patients admitted to our SICU, 432 (16%) developed ARDS. Of those, 100 (23%) were categorized as mild, 176 (41%) as moderate and 156 (36%) as severe ARDS. The 2272 trauma patients that did not develop ARDS served as our control group. Patients who developed ARDS were more often transfused (71% vs. 38%, p<0.0001) and received more units of packed red blood cells (PRBC: 6 vs. 1, p<0.0001), plasma (4 vs. 0.7, p<0.0001), and platelets (1.1 vs. 0.2, p<0.0001). After logistic regression, independent risk factors associated with developing ARDS included male gender (OR=1.3, CI=1.0-1.8, p=0.049), blunt mechanism (OR=2.5, CI=1.4-4.4, p=0.003), severe (AIS >/=3) head (OR=1.4, CI=1.1-1.9, p=0.01) and chest (OR=2.4, CI=1.9-3.2, p<0.0001) injuries, total PRBC transfusion (OR=1.1, CI=1.0-1.2, p=0.009) and total combined (PRBC, plasma, and platelets) transfusion of blood products (OR=1.05, CI=1.0-1.1, p=0.01). Independent risk factors for progression of severity of ARDS from mild to moderate to severe included severe (AIS>/=3) chest injury (OR=2.1, CI=1.5-3.1, p<0.0001) and total plasma transfusion (OR=1.03, CI=1.0-1.1, p=0.01). Patients who developed ARDS had a higher mortality (20% vs. 3%, p<0.0001)

Conclusion: Male gender, blunt trauma, severe head and chest injuries, and PRBC as well as total blood product transfusion are associated with ARDS as defined by the Berlin criteria. Progression of severity from mild to moderate to severe ARDS is associated with severe chest trauma and volume of plasma transfusion.

Poster # 33

THE METABOLOMIC EFFECTS OF ENDOTOXIN ADMINISTRATION IN HEALTHY HUMAN VOLUNTEERS

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Introduction: The initial systemic manifestations of inflammation, resulting from injury or infection are mechanistically and temporally linked with activation of innate immunity and neuro-endocrine axes. Although controlled administration of an innate immune activating ligand, (i.e. Toll-like receptor-4 agonist, endotoxin) induces inflammatory mediator production and robust phenotypic manifestations in a dose-response manner there have been limited studies documenting the metabolomic profiles created by endotoxin challenge in humans. In the present study, we characterize these effects in healthy human volunteers.

Methods: Fifteen human volunteers received intravenous endotoxin (2ng/kg); four received saline placebo. Blood samples were obtained at various time points (t=0, 1, 2, 6, 24hr) and analyzed using a proprietary solvent extraction method with gas chromatography (GC/MS) and liquid chromatography mass spectroscopy (LC/MS/MS) (Metabolon) to identify the concentrations of 363 biochemicals at various time points. Study subjects were compared to the placebo group and expressed as fold change. ANOVA identified moieties that differed between groups ($p<0.05$).

Results: After a single endotoxin challenge, significant metabolomic changes occurred in healthy volunteers which suggest acute proteolysis, increased glucose utilization, up-regulation of omega-fatty acid oxidation, altered nitric oxide formation, acute hemolysis, altered bile acid metabolism, and altered cellular respiration. See Figure 1.

Conclusion: The present study documents the effects of TLR4 agonist administration on metabolic pathways in healthy human subjects. These observations emphasize the dynamic nature of acute systemic inflammation and indicate that metabolic changes are evident within hours of exposure to pathogen-associated molecular patterns (PAMPs). Future work should focus on identifiying predictive metabolic patterns in critically ill patients which may aid in the early identification of sepsis or other acute inflammatory processes.

Comparison mean values significantly different: $p \le 0.05$, fold of change ≥ 1.00; $p \le 0.05$, fold of change < 1.00

Comparison mean values approaching significance: $0.05 < p < 0.10$, fold of change ≥ 1.00; $0.05 < p < 0.10$, fold of change < 1.00

Super Pathway	Sub Pathway	Biochemical Name	Endotoxin/Placebo Fold Change 0h	1h	2h	6h	24h
Amino Acid	Histidine metabolism	histidine	1.10	1.11	1.07	1.02	1.03
		3-methylhistidine	4.33	5.81	5.45	3.48	1.61
	Lysine metabolism	glutarate (pentanedioate)	1.10	0.95	1.03	2.01	1.35
		pipecolate	1.06	1.74	1.80	1.52	1.35
	Valine, leucine and isoleucine metabolism	isoleucine	1.26	1.07	1.01	0.81	1.13
		leucine	1.21	1.10	1.09	0.92	1.17
		valine	1.22	1.12	1.10	0.96	1.15
		3-methyl-2-oxopentanoate	1.22	1.14	1.34	1.36	1.17
	Creatine metabolism	creatine	1.71	1.72	1.64	1.43	1.49
Carbohydrate	Glycolysis, gluconeogenesis, pyruvate metabolism	3-phosphoglycerate	1.05	0.97	0.64	1.56	1.48
		pyruvate	0.92	0.99	0.80	1.48	0.95
		lactate	1.05	1.11	1.01	1.44	1.00
Lipid	Essential fatty acid	docosapentaenoate	1.39	1.34	1.58	2.71	2.16
	Fatty acid, dicarboxylate	sebacate (decanedioate)	1.02	1.14	1.47	1.56	1.00
		tetradecanedioate	1.14	1.27	1.58	2.34	0.86
		hexadecanedioate	1.07	0.97	1.15	1.97	1.23
		octadecanedioate	1.03	0.97	1.09	1.65	1.04
	Bile acid metabolism	cholate	1.28	2.98	1.99	1.29	1.10
		glycocholate	1.58	1.13	2.16	5.13	6.77
	Sterol/Steroid	cholesterol	1.12	1.08	1.12	1.03	1.39
		cortisol	1.04	2.01	1.47	1.74	1.26
		corticosterone	1.03	1.13	1.10	0.88	1.13
		cortisone	1.07	1.24	1.21	1.41	1.21
		pregn steroid monosulfate*	1.04	1.08	1.44	1.93	1.04
		pregnenolone sulfate	1.21	1.48	1.76	1.93	1.06
Nucleotide	Purine metabolism	hypoxanthine	1.12	1.05	1.13	1.53	1.03
		adenosine 5'-monophosphate (AMP)	1.26	1.68	1.44	2.43	1.95
		adenosine 5'-diphosphate (ADP)	1.53	1.76	1.67	2.98	1.38
		adenosine 5'-triphosphate (ATP)	1.29	1.37	1.11	1.32	1.00
Cofactors	Hemoglobin and porphyrin metabolism	heme	0.67	0.48	0.38	1.15	1.05
		L-urobilin	1.05	1.01	2.05	3.43	2.42
		urobilinogen	0.55	0.31	0.50	0.48	0.72

Poster # 34

Apneic Oxygenation Decreases the Incidence of Desaturation in Trauma Patients Undergoing Rapid Sequence Intubation

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Introduction: Rapid sequence intubation (RSI) is the preferred technique for securing a definitive airway in trauma patients. Hypoxia is an uncommon yet potentially morbid complication of intubation. Apneic oxygenation, which involves the administration of continuous high-flow oxygen via nasal cannula in addition to standard preoxygenation techniques, has been shown to increase the duration of normoxia and prevent desaturation in various patient populations. Data supporting the use of this technique in trauma patients are limited. We hypothesized that apneic oxygenation would be associated with a decreased incidence of desaturation in trauma patients undergoing RSI.

Methods: We performed a 1-year retrospective analysis of our Level 1 trauma center registry to identify all adult patients undergoing intubation in the trauma resuscitation bay. Patients who were intubated in the field and those who did not survive beyond the resuscitation room were excluded. Variables collected included demographics, body mass index, comorbidities, mechanism of injury, Injury Severity Score (ISS), indication for intubation, and details of the intubation (provider specialty, number of attempts, grade of view). Patients who underwent apneic oxygenation were compared to those who did not. The main outcome measure was the occurrence of desaturation (SpO2 $\leq$92%) during intubation. Multivariable logistic regression analysis was performed to identify independent predictors of desaturation.

Results: Of 144 patients, 74 patients (51%) underwent apneic oxygenation. There were no significant differences with regards to age, gender, or mechanism. Type and severity of chest injuries were likewise similar. Patients undergoing apneic oxygenation had a lower ISS (24 $\pm$14 vs. 29 $\pm$ 20, p=0.03), lower incidence of morbid obesity (40% vs. 60%, p=0.02), and were less likely to be hypotensive (37% vs. 58%, p=0.02). Although there was a significant difference in the incidence of desaturation between patients who did and did not undergo apneic oxygenation (24% vs. 44%, p=0.02), the lowest SpO2 did not differ. On multivariate analysis, after controlling for ISS, morbid obesity, hypotension, and hypoxia as the primary indication for intubation, apneic oxygenation was found to be protective for desaturation (OR=0.4; 95% CI=0.16-0.91, p=0.03), whereas morbid obesity was associated with an increased risk for desaturation (OR=2.7; 95% CI=1.15-6.56, p<0.01).

Conclusion: Apneic oxygenation is associated with a decreased incidence of desaturation in trauma patients undergoing RSI. Further study is required to determine the optimal indications, dose, and patient populations most likely to benefit from this minimally invasive and easy to perform technique.

Poster # 35

INFECTION DIAGNOSIS IN SYSTEMIC INFLAMMATION BY INNATE IMMUNE RECEPTOR EXPRESSION PATTERN

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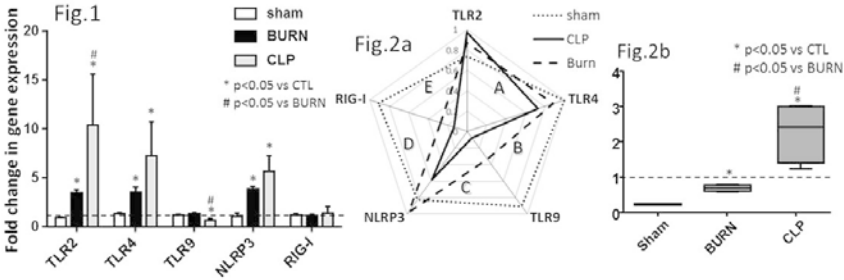
Introduction: It is difficult to diagnose infection by single biomarker in patients who are under condition of systemic inflammation. We hypothesized that expression pattern of innate immune receptors may distinguish infection from systemic inflammation of uncertain etiology.

Methods: To compare infectious inflammation and sterile inflammation, we employed cecal ligation and puncture (CLP) and 20% full thickness burn injury (Burn) model. C57BL/6 mice underwent sham, CLP, or Burn. 24 hours later, mice were sacrificed, and total RNA was extracted from whole blood. Using quantitative real-time PCR, we investigated gene expression of innate immune receptors including TLR2, TLR4, TLR9, NLRP3 and RIG-I. To evaluate all the gene expression together as patterns, each value was plotted on the radar chart and the area was calculated. To compare gene expression patters as graphic characters, area A / (B+C+D+E) was defined as bacterial infection index (BI) and evaluated.

Results: Gene expression of TLR2, TLR4 and NLRP3 was significantly increased in both CLP and Burn compared to sham ($p<0.05$). Gene expression of TLR9 was significantly decreased in CLP compared to both sham and Burn ($p<0.05$). RIG-I gene expression did not show any difference (Fig.1). In the radar chart, each group showed distinctive gene expression patterns (Fig.2a). BI in CLP was significantly higher than sham and Burn ($p<0.05$, sham: min=0.19, max=0.25, mean=0.23, CLP: min=1.24, max=3.01, mean=2.26, Burn: min=0.58, max=0.77, mean=0.67), and BI higher than 1.0 distinguished infection clearly from the other groups (Fig.2b).

Conclusion: Gene expression profile of innate immune receptors distinguishes infection from sterile systemic inflammation. BI can assess multiple factors together, and will be convincing marker to diagnose infection.



Poster # 36

RISK FACTORS FOR EXTUBATION FAILURE AT A LEVEL 1 TRAUMA CENTER: DOES THE SPECIALTY OF THE INTENSIVIST MATTER?

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Introduction: Failure of extubation following a period of mechanical ventilation in critically ill patients is associated with higher morbidity, mortality, and longer ICU length of stay. Although predictors of failed extubation have been previously determined in ICU cohorts, relatively less attention has been directed toward this issue in trauma patients. The aim of this study was to identify predictors of extubation failure among trauma patients in a multidisciplinary ICU setting.

Methods: A prospective observational study of extubation failures (EF) was conducted at an ACS Level 1 trauma center over a three-year period (2011-2013). Case control patients (CONT) were then compared to the study group (EF) with respect to demographic and clinical characteristics as well as outcomes. Failure of extubation was defined as reintubation within 72 hours following a planned extubation. Patients who self-extubated or were less than 15 years of age were excluded from the study.

Results: During the study period, 7,830 patients were admitted to the trauma service and 1,098 (14%) underwent mechanical ventilation. 63 patients met inclusion criteria for the EF group, and 63 successful extubations comprised the CONT group. The overall rate of extubation failure was 5.7% and mean time to reintubation was 13.0 hours. Groups (EF vs. CONT) were similar for ISS (21 vs. 21), GCS (12 vs. 11), number of comorbidities (2 vs. 2), injury mechanism (blunt 79% vs. 74%), and BMI (27.9 vs. 27.2). In addition, groups were similar with respect to weaning protocol compliance (84% vs. 89%, $p = 0.57$). The EF group had significantly increased ICU LOS (15.7 vs. 7.4 days, $p < 0.001$), ventilator days (13.3 vs. 4.8, $p < 0.001$) and mortality (9.5% vs. 0%, $p = 0.03$). Multiple regression analysis identified that EF was associated with significantly increased odds of: (i) temperature > 38 ºC at the time of extubation (OR 5.9, 95% CI 1.7 – 20.8), and (ii) non-surgeon intensivist consultation (OR 24.2, 95% CI 5.5 – 105.9).

Conclusion: Extubation failure is associated with increased length of stay, ventilator days, and mortality in trauma patients. Fever at time of extubation is significantly associated with extubation failure, and the presence of such should give pause in the decision to extubate. Non-surgeon intensivist involvement increases the risk of extubation failure, and a surgical critical care service may be most appropriate for the management of mechanically ventilated trauma patients.

Poster # 37

THE LOW MOLECULAR WEIGHT FRACTION OF HUMAN SERUM ALBUMIN (HSA) INHIBITS NFκ B SIGNALING

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Introduction: A major pathway stimulated by trauma-induced inflammation is the NFκ B signaling network. NFκ B signaling results in downstream cellular responses that include production of pro-inflammatory cytokines, such as IL-1β and TNFα. Systemic inflammation may promote multiple-organ failure during severe trauma, in which NFκ B signaling plays a central role. Historically, severe trauma patients have been treated with Human Serum Albumin (HSA) to decrease tissue edema and for fluid resuscitation. We have identified anti-inflammatory properties in the Low Molecular Weight Fraction of HSA under 5,000 Daltons (LMWF-5A) and sought to determine whether it inhibits NFκ B signaling.

Methods: Human embryonic kidney cells (HEK-293T) expressing a luciferase reporter gene driven by four NFκ B-response elements were treated with either saline control or LMWF-5A in the presence of IL-1β or TNFα. Luciferase activity was measured 3h following cytokine exposure and normalized for cell viability. we also used human synovial primary fibroblasts (HSF-OA). To determine differential gene expression, RNA sequencing of whole transcriptome and miRNA expression was performed on HSF-OA either treated with saline or LMWF-5A for 24h with or without IL-1β stimulation. Significantly differentially expressed transcripts were identified in saline versus saline+IL-1β (SvS+I) and LMWF-5A versus LMWF-5A+IL-1β (LvL+I). Ingenuity® Pathway Analysis (IPA) was used to determine relevant gene networks differentially regulated by LMWF-5A versus saline in IL-1β-stimulated cells.

Results: In TNFα-stimulated HEK-293T cells, NFκ B transcriptional activity was decreased by ~30% in LMWF-5A treated cells. A known transcriptional target gene of NFκ B, Interleukin-8 (IL-8) was differentially induced when comparing SvS+I and LvL+I gene lists, indicating a ~700-fold decrease in IL-8 mRNA induction in the presence of LMWF-5A. Differential expression of several mediators of NFκ B signaling were also observed, including NFκ B inhibiting kinase (NIK), NFκ B2, and RELB, all members of the non-canonical NFκ B pathway. All of these transcripts decreased or did not increase in the presence of LMWF-5A versus saline when cells were stimulated with IL-1β. Furthermore, treatment with LMWF-5A completely blocked expression of miR-486. By repressing negative NFκ B feedback loops, miR-486 perpetuates NFκ B signaling, lending more support to LMWF-5A inhibition of NFκ B signaling.

Conclusion: Together, these data support the hypothesis that LMWF-5A inhibits NFκ B signaling on a global level through regulation of NFκ B relevant transcripts and miRNA. Systemic administration of LMWF-5A may ameliorate inflammation in trauma patients.

Poster # 38

SEVERITY OF ALCOHOL WITHDRAWAL SYNDROME IS ASSOCIATED WITH MORBIDITY BUT NOT MORTALITY OR INJURY CHARACTERISTICS IN TRAUMA PATIENTS

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Introduction: Alcohol use and abuse is prevalent among patients with traumatic injury, increasing the risk of Alcohol withdrawal syndrome (AWS). AWS is associated with high morbidity and increased LOS, with disparate findings on its effect on mortality. The objective of this study was to determine incidence and outcomes of AWS, and determine if severity of AWS is associated with clinical outcomes, patient demographics, and injury characteristics.

Methods: This was a multicenter, retrospective registry cohort study of 28,101 patients with trauma conducted over 5 years (2010-2014). AWS was defined by physician diagnosis, and was further categorized by AWS severity using the highest recorded Clinical Institute Withdrawal Assessment for alcohol (CIWA-Ar) score into minor (<8), moderate (8-15), severe (16-29) and extreme (> 29). Chi-square trend tests and ANOVA were used to examine the association between AWS severity and demographics (age, gender, race, arrival blood alcohol concentration), injury characteristics (ISS, injury mechanism, presence of head injury) and outcomes (mortality, hospital LOS, sequelae of AWS). Multivariate logistic regression and ANCOVA were used to determine if AWS severity was associated with outcomes.

Results: AWS developed in 0.88% (n=248), and was mild in 9%, moderate in 21%, severe in 49%, and extreme in 21%. Severity of AWS was not associated with any demographic or injury characteristics ($p > 0.40$ for all). The most frequent sequelae of AWS were respiratory distress (24%), encephalopathy (21%), delirium tremens (11%) and withdrawal seizures (6%); severity of AWS was associated with delirium tremens only (p=0.001). Hospital LOS was significantly prolonged with development of AWS and with increasing AWS severity, before and after adjustment (table 1, $p < 0.001$). Mortality was not significantly different by presence of AWS or severity of AWS, prior to adjustment (table 1, p=0.96) or after adjustment for age and cause of injury (OR: 1.16, 0.77, and 0.81 for moderate, severe, and extreme vs. mild severity; p=0.98).

Conclusion: We were unable to predict the severity of AWS with injury or demographic characteristics. Although mortality was not increased with AWS, there is considerable morbidity and use of hospital resources associated with more severe manifestations of AWS in patients with trauma.

Table 1. Outcomes in trauma patients by severity of Alcohol Withdrawal Syndrome (AWS)

AWS by severity	n (%)	Median (IQR) ISS	Mortality	Median (IQR) LOS	LSM** LOS, adjusted
No AWS	27,853	9 (4-13)	3.45%	3 (1-5)	4.79
Mild AWS (CIWA < 8)	19	12 (9-21)	5.26%	6 (4-21)	12.98
Moderate AWS (CIWA 8-15)	45	10 (5-18)	4.44%	9 (5-19)	14.52
Severe AWS (CIWA 16-29)	106	13 (7-17)	2.86%	15 (9-24)	16.80
Extreme AWS (CIWA >29	46	11 (9-14)	2.22%	17 (10-24)	18.83
p value		0.81	0.96	**< 0.001**	**< 0.001**

*32 patients with AWS were missing CIWA scores

**Adjusted for ISS and age

Poster # 39

NATIONAL ESTIMATES OF THE USE AND OUTCOMES OF EXTRACORPOREAL MEMBRANE OXYGENATION AFTER ACUTE TRAUMATIC INJURY

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Introduction: The use of extracorporeal membrane oxygenation (ECMO) as salvage therapy for patients with severe Acute Respiratory Distress Syndrome (ARDS) is gaining greater acceptance among trauma intensivists. To date, national estimates regarding the use of ECMO as a viable treatment in post-traumatic severe ARDS have not been reported. The objective of this study was to review ECMO usage in trauma patients in the United States.

Methods: The Nationwide Inpatient Sample (NIS) from years 2002 to 2012 was queried for patients aged 15 and older treated with ECMO who had one or more acute traumatic injuries as defined by International Diagnostic Codes, ninth edition (ICD-9). The primary outcomes of interest were incidence of ECMO and overall inpatient mortality in patients receiving ECMO.

Results: A total of 1,347 patients were identified in the NIS database that had both ECMO performed and ICD-9 codes consistent with trauma. The majority of patients identified were between the ages of 15-29 years (31.4%) and male (65.5%). The incidence of ECMO for patients after traumatic injuries has increased 66 fold over the 10-year period. In hospital mortality decreased from 100% at the beginning of the study to 42% at the conclusion (mean mortality was 48.0% overall) with a decreasing trend over the study period that approached statistical significance ($p=0.06$).

Conclusion: While ECMO use in patients with severe ARDS in the post-trauma setting remains controversial, there is an increasing trend to utilize ECMO nationwide, suggesting an increasing acceptance and/or increased availability at trauma centers. With a subsequent decrease in mortality over the study period, the use of ECMO as a salvage method in trauma patients with refractory ARDS remains a potentially viable option. Additional evaluation in a prospective manner could further clarify risks and benefits.

Poster # 40

PERIOPERATIVE RESUSCITATION GUIDED BY TRANSESOPHAGEAL ECHOCARDIOGRAPHY: AN INITIAL EXPERIENCE

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Introduction: Traditional measures of evaluating volume status, namely central venous pressure (CVP), pulmonary artery occlusion pressure, and physical exam are often challenging to interpret and potentially unreliable in critically ill and ventilated patients. Echocardiography has become widely accessible and routinely used in the critical care setting as a tool to evaluate the hemodynamics of patients. The use of transesophageal echocardiography (TEE) for peri-operative resuscitation in trauma care has been limited by cost and clinical skill set. The authors report a series of surgeon-performed hemodynamic TEE.

Methods: Records of intubated patients treated in a regional Level I trauma center who underwent hemodynamicTEE (hTEE) between December 2012 and April 2015 were reviewed. The clinical course of each patient was recorded. Limited TEE views including superior vena cava (SVC), mid esophageal 4-chamber (ME4CH), and short axis transgastric (TGSAV) were prospectively collected and stored on an hTEE system (ImaCor, Inc, NY, USA). The video observations were collected prospectively and then retrospectively evaluated for quality. All bedside interpretations of TEE images were retrospectively reviewed for accuracy and quality by a surgical intensivist with training in echocardiography. A 3-point quality scale (1:Poor, 2:Average. 3:Excellent) was used for evaluation of each recorded image.

Results: A total of 109 patients received formal hemodynamic evaluation using a TEE over a 28-month period. The mean age of the cohort was 48.1 (SD:18.2) years with the majority of male gender (70.6%). There were no complications identified related to TEE probe placement. A total of 1212 observations were made over the study period with an average of 11.0 (SD:9.4) observations recorded per patient. Each observation period took an average of 12min and 32sec (SD: 9min, 11sec). The majority of the time TGSAV (46.1%) views were established followed by ME4CH (30.2%) and SVC (23.7%). The TGSAV was mostly commonly used for evaluation of hemodynamic function. Best quality images were TGSAV (2.82/3) followed by ME4CH (2.51/3) and SVC (2.07/3). The mean SVC Collapsibility Index was 0.28 (SD:0.16) and the left ventricle end diastolic area (LVEDA) was less than 10cm 2 53.2% of the time prompting further fluid resuscitation. Sixty-three (57.8%) patients had at lease two documented TEE evaluation periods. Of those with repeated observations, LVEDA and SVC were noted to be improved 76.2 and 63.2% of the time, respectively, suggesting favourable responses to fluid administration.

Conclusions: Perioperative hemodynamic evaluation using TEE is feasible and provides accurate assessment of cardiac function and support of resuscitative measures. The image quality and hemodynamic evaluation was best evaluated using the TGSAV. Serial exams provide both quantitative and qualitative response to fluid administration. The integration of TEE is a useful adjunct to peri-operative hemodynamic evaluation in critically ill patients.

Poster # 41

Combat Vascular Injury: Influence Of Mechanism Of Injury On Outcome

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Introduction: Combat trauma commonly results in vascular injury. Worse outcomes have been reported anecdotally for vascular injuries associated with blast versus gunshot wound (GSW) trauma. Aims. We wished to examine the UK deployed military vascular injury experience during Operations Telic and Herrick. Using injury severity matched blast and GSW cohorts, we investigated differences in graft thrombosis, haemorrhage, infection, mortality and amputation.

Methods: Joint Theatre Trauma Registry cases (blast or GSW, vascular injury, head injury AIS<6, recordable R3 BP and HR) were examined using multivariate analysis, Chi2, or t-tests with post-hoc correction.

Results: 992 patients with vascular injuries were identified (2003-2014); 115 had arterial injuries, met eligibility criteria and had follow-up data. Mortality was 10.44%, median survival 1 day (IQR 0.0–6.0). Injured sites were: Lower limb 27.83% (32), upper limb 21.74% (15), trunk 10.44% (12), neck 7.83% (9), and distal (to popliteal / brachial) extremity 32.17% (37). 7.83% underwent a proximal amputation (median 10 days (IQR 2.50 – 224.50) from admission). Interventions were interposition graft (28.70%), ligation (22.61%), shunt (7.86%), patch 3.48% or primary repair 11.30%. The remainder underwent proximal amputation or exploration (blast / GSW groups p=0.073). Blast (N=80) and GSW (N=35) groups had comparable demographics, extraction time, number and distribution of arterial injuries, ISS / AIS≥3, and tourniquet use. The blast group had more regions injured, blood products, amputations, and more theatre minutes (247.3± 140.6 vs 160.2± 91.9; p=0.002)). No differences were identified in overall complications (28.75% blast vs 31.23% GSW (p=0.475), haemorrhage, infection, mortality, amputation or graft thrombosis (11.25% blast vs 2.86% GSW (p=0.144).

Conclusion: Despite no differences in overall blast and GSW complications, graft thrombosis was four times as likely with blast aetiology. Combining these data with similar datasets amongst coalition patients may allow us to understand the true influence of blast on outcome in vascular trauma.

Poster # 42

IF IT'S BROKE, FIX IT: REPAIR OF MAJOR LOWER EXTREMITY VEIN INJURIES REDUCES COMPLICATIONS COMPARED TO LIGATION

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Introduction: Both repair and ligation approaches have been well described for traumatic lower extremity venous injuries. However, comparative outcomes data demonstrating which approach might be preferable and under what circumstances, are limited. We therefore sought to compare outcomes of venous repair versus ligation for such injuries at an urban level-one trauma center.

Methods: We performed a retrospective review of patients presenting with traumatic lower extremity venous injuries to a large level-one academic, urban trauma center between 2004 and 2014. All patients with identified injuries to the external iliac (EIV), common femoral (CFV), femoral (FV), and popliteal veins (PV) who underwent repair or ligation were included. Patient demographics, vein injured, operative details, hospital course, and outcomes were recorded. Limb complications were defined as delayed (after initial operation) fasciotomy, delayed amputation, wound complications, symptomatic edema, ulceration and persistent pain.

Results: Our sample included 107 patients with the following anatomic distribution of injuries: EIV in 22.4% (n=24); CFV in 35.5% (n=38); FV in 16.8% (n=18); and PV in 25.2% (n=27). Ligation was performed in 64% (n = 68) of patients while repair was performed in 36% (n = 39). There were no differences in age, sex, length of stay, injury severity score, and length of ICU stay. Limb complications were observed in 28% (n=30) of injuries and were more likely to be seen with ligation procedures than with repair, 36.8% (n=25) versus 12.8% (n=5) (p=0.008) respectively. Furthermore, 37% (n=40) of patients received fasciotomies at the initial presentation and was observed in 41% (n=28) of the ligation group and 31% (n=12) in the repair group (p=0.3). Delayed fasciotomy was required in 12% (n=13) of injuries and was not predicted by the type of management (p=0.1). Delayed amputations (n=4) were equally seen in the ligation and repair groups (p=0.6). Observed 30-day mortality did not differ between the two groups (p=0.4).

Conclusion: Repair of lower extremity venous injuries is associated with lower risk for limb complications. Specific outcomes including delayed amputation and delayed fasciotomy were not influenced by the type of management selected. Therefore either modality is reasonable for achieving limb salvage in this patient population. However if allowable venous repair may be considered to decrease limb complications and morbidity. Long-term data comparing venous ligation and repair may offer additional insight for management selection.

Poster # 43

RESILIENCE, DEPRESSION, AND POSTTRAUMATIC STRESS DISORDER IN ORTHOPEDIC TRAUMA PATIENTS

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Introduction: Depression and posttraumatic stress disorder (PTSD) are prevalent in orthopedic trauma and are predictive of poor outcomes related to disability, pain intensity and overall functionality following injury. Resilience is defined as the ability to adapt under stress or adversity and can be measured with the Connor-Davidson Resilience Scale 10 item (CD-RISC 10). This study examines the prevalence of and relationship between resilience, depression and PTSD in orthopedic trauma patients.

Methods: One hundred and sixty orthopedic trauma inpatients completed measures for depression (Patient Health Questionnarie-8 Item (PHQ-8), PTSD symptoms (Primary Care PTSD screen (PC-PTSD) and PTSD Checklist-Civilian version (PCL-C)), and resilience (CD-RISC 10) at baseline and 12 months post-injury. Resilience scores were categorized as low, intermediate, or high and compared with depression and PTSD evaluations at baseline and 12 months post-injury.

Results: Depression was seen in 28% of patients at baseline and 29% at 12 months. PTSD symptoms were prevalent in 23% at baseline and 21% at 12 months. Resilience scores at baseline and 12 months were divided into three categories: low (14%, 16%, respectively), intermediate (70%, 68%), and high (16%, 16%). There was no significant difference in the prevalence of depression, PTSD symptoms or resilience scores at baseline and 12 months post-injury. There was a significant relationship between resilience and depression at both baseline and 12 months ($p=0.0015$, $p=0.0003$) and between resilience and PTSD symptoms at baseline and 12 months ($p=0.024$, $p=0.0002$).

Conclusion: Low resilience scores are correlated with the presence of depression and PTSD symptoms at both baseline and 12 months post-injury in orthopedic trauma patients. Prevalence of depression and PTSD are significant immediately following (28%, 23%, respectively) and 12 months after traumatic injury (29%, 21%). These results highlight the need for early screening and intervention for depression and PTSD. They further demonstrate the importance of resilience in recovery from orthopedic trauma. The level of resilience and its impact within the orthopedic trauma population merit further investigation.

Poster # 44

OPTIMAL TIMING FOR REPAIR OF PERIPHERAL NERVE INJURIES

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Introduction: Peripheral nerve injuries are debilitating for patients who survive severe trauma. Data regarding outcomes is limited, and the optimal management strategy for an acute injury is unclear. We aim to study clinical influences on motor-sensory outcomes and to review epidemiology and current management of peripheral nerve injuries.

Methods: Single center, retrospective study. Patients with traumatic peripheral nerve injury 01/2010 – 06/2015 were included. Exclusion criteria: mortality, amputation, brachial plexus injury, and missing motor-sensory exams. Motor-sensory exams were graded 0-5 by the Modified British Medical Research Council system. Operative repair of peripheral nerves was analyzed for the following variables: patient characteristics, anatomic nerve injured, level of injury, associated injuries, and operative characteristics (presence of “damage control surgery” (DCS), days until repair, and repair method).

Results: 311 patients met inclusion criteria. 258 (83%) patients underwent operative management, and 53 (17%) underwent non-operative management. Those who required operative intervention had significantly more penetrating injuries 85.7% vs 64.2% ($p<0.001$), worse initial motor scores 1.19 vs 2.23 ($p=0.004$), and worse initial sensory exam scores 1.75 vs 2.28 ($p=0.029$). Predictors of improved operative motor outcomes on univariate analysis were Injury Severity Score (ISS) <15 ($p=0.013$) and male sex ($p=0.006$). Upper arm level of injury was a predictor of poor outcome ($p=0.041$). Multivariate analysis confirmed male sex as a predictor of good motor outcome ($p=0.014$, AOR=3.88[1.28-11.80]). Univariate analysis identified distal forearm level of injury ($p=0.026$) and autograft repair ($p=0.048$) as predictors of poor sensory outcome. DCS ($p=0.257$) and days to nerve repair ($p=0.834$) did not influence motor-sensory outcome.

Conclusion: Influences on outcome in peripheral nerve repair included ISS, patient sex, and level of injury. Timing of repair did not impact clinical outcomes. Operative repair of peripheral nerve injuries can be performed after other life threatening injuries are addressed.

Poster # 45

PELVIC ANGIOEMBOLIZATION: HOW FAR DOWN THE RABBIT HOLE?

Aimee Hymel MD, Sabrina Asturias MD, Frank Zhao MD, Ryan Bliss MD, Thea Moran MD, Richard H. Marshall MD, Elizabeth Benjamin* MD,Ph.D., Herb A. Phelan* MD, MSCS, Peter C. Krause MD, John P. Hunt* MD,MPH, Jennifer L. Mooney MD, LSU Department of Surgery

Introduction: Blunt trauma leading to pelvic fractures and associated hemorrhage is a significant challenge. Interventional radiographic approaches to control pelvic bleeding have become the standard of care. One limitation of pelvic angiography is that it only identifies and treats the arterial injuries. When the angiogram is positive, a choice exists on non-selective embolization (NSE) of the internal iliac arteries versus selective embolization (SE) of distal branches. There is no clear standard on which type of embolization is best and what to do when the angiogram is negative. The purpose of this study was to define the risk profiles of non-selective embolization (NSE) versus selective embolization (SE). Secondarily, we sought to determine if prophylactic embolization in the face of a negative angiogram decreases blood transfusion requirements.

Methods: A multicenter retrospective review was conducted from three level one-trauma centers. The study population consisted of all blunt trauma patients with pelvic fractures who underwent angiography from January 2012 to December 2014. Exclusion criteria consisted of age less than 18. Demographic and clinical data was gathered from the trauma database and review of medical record after appropriate IRB approval. Inpatient embolization specific complications included wound infection or breakdown, gluteal or skin necrosis and osteomyelitis. Outpatient complications included claudication, sexual dysfunction, numbness, pain, urinary dysfunction, wound infection or breakdown, non-union or osteomyelitis. Thromboembolic complications included deep vein thrombosis or pulmonary embolism.

Results: One hundred ninety four patients made up the study population with a mean injury severity score of 26.33 and overall mortality of 19.6%. One hundred and forty five patients (75%) underwent embolization. Of the patients embolized, 68% (n=99) were a NSE and 32% (n=46) were SE. Both groups were equally matched in terms of age, ISS, pelvic abbreviated injury score, hemodynamic and physiological parameters. Length of procedure was significantly shorter in the NSE group (34.83+38.613 vs. 72.68+50.768, $p<0.001$). There was no significant difference in the rate of embolization specific complications between the two groups (4.0 % vs 4.3%, p=0.931). Thromboembolic events occurred significantly more often in the NSE group (12.1% vs 0, p =0.014). Sixty-seven patients had a negative angiogram. Twenty-six (39%) of those patients were prophylactically embolized. There was no significant differences in amount of blood transfused in the first twenty-four hours (3.4 +3.7 vs 5.3+8.3 units of packed red blood cells (PRBCs), p=0.277) blood transfused during the total hospital stay (6.7+5 vs 10.2+14 units of PRBCs, p=0.223), nor inpatient embolization related complications (3.8% vs. 14.6%, p=0.159) between patients prophylactically embolized and those who were not.

Conclusion: Our study confirms the lethal nature of pelvic fracture associated hemorrhage with a mortality of 19.6%. When the angiogram is negative, performing a prophylactic embolization does not significantly reduce blood loss. In those patients who have a positive angiogram, the decision to perform a NSE versus SE should be made based on hemodynamic stability. Time to control of hemorrhage is significantly shorter in NSE; however this comes at a potential cost of increased thromboembolic events.

Poster # 46

PARTIAL OCCLUSION STRATEGY WITH REBOA IS FEASIBLE AND SAFE COMPARED WITH FULL OCCLUSION TREATMENT FOR TRAUMATIC HEMORRHAGIC SHOCK PATIENTS

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Introduction: Recently, REBOA (resuscitative endovascular balloon occlusion of the aorta) has been entering in the limelight as one of the first-line procedures for a traumatic hemorrhagic shock patient. Some papers reported that REBOA was less invasive than resuscitative open aortic cross clamping and effective for critically hemorrhagic shock from pelvic fractures. On the other side, some studies pointed out that REBOA treatment was associated with a higher mortality. REBOA would be one of the temporal hemostatic methods that bridge to fundamental hemostasis. Then, is it possible trying to control hemorrhage as early as possible would do harm to a survival outcome? We made a hypothesis that one of the prognostic factors would be the strategy after doing REBOA. According to some case reports, continuous full occlusion of aorta over 45 minutes caused deadly complications but longer occlusion with partial volume were possible without severe ischemia. Then we studied the possibility of partial occlusion strategy as a REBOA to severe trauma.

Methods: Consecutive traumatic hemorrhagic shock patients who were undergone REBOA as a first-line resuscitative treatment at our emergency and trauma center, and whose hemodynamics were stabilized with doing REBOA and could get through a fundamental hemostasis by operative management and/or transcatheter arterial embolization were included. They were sorted into full occlusion treatment group (groupF) and partial occlusion treatment group (groupP). Group F were basically treated with keeping full occlusion but release the balloon pressure within every 30 minutes in order to avoid ischemic injuries. Group P were treated with permissive hypotension strategy (sBP>80mmHg) and tried to keep partial occlusion as long as possible. The primary end point was a survival rate at 30 days after injury. Secondary end points were fluid factors as total amount of bleeding, saline infusion and blood transfusion, and ischemic or reperfusion complications.

Results:43 trauma patients were treated with REBOA and 26 patients were succeeded in REBOA resuscitation and sorted into two groups (GroupF 15 patients and GroupP 11 patients). There were no significant differences in age (GroupF vs. GroupP : 45.8 vs 39.6), rate of blunt trauma (13/15 (87%) vs. 9/11 (82%)), ISS (38.2+/-14.1 vs. 43.8+/-15.2), initial sBP (46.6 vs. 58.2), initial shock index(2.3 vs. 2.4), any laboratory data. RTS was significantly lower in GroupF (3.52 vs. 5.65, p=0.02). Total duration of REBOA (65.8min vs. 72.1min) and maximum continued duration of occlusion (32.5min vs. 28.8min) were not different significantly, but duration of partial occlusion was much longer in GroupP (11.8min vs. 38.4min). There were no significant difference in any fluid factors and a survival rate (9/15 (60%) vs. 3/11 (27%)), and rate of complications (no organ ischemia, leg ischemia (0/15(0%) vs. 1/11(9%)), hyperkalemia (4/15 (27%) vs. 4/36 (36%)).

Conclusion: Partial occlusion treatment with REBOA did not increase any amount of bleeding, blood transfusion, complications and mortality rate compared with full occlusion treatment. Then it would be a feasible and safe as a REBOA treatment.

Poster # 47

TIME TO AORTIC OCCLUSION: IT'S ALL ABOUT ACCESS

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Introduction: Resuscitative endovascular balloon occlusion of the aorta (REBOA) is a less invasive method of proximal aortic occlusion compared to resuscitative thoracotomy with aortic cross-clamping (RTACC). The aim of this study was to compare time to aortic occlusion with REBOA and RTACC, both including and excluding time required for CFA cannulation.

Methods: Patients receiving REBOA or RTACC performed between Feb 2013 and Jan 2016 captured on real-time videography were included. Timing of all procedural steps was collected: initial skin incision to aortic cross-clamp for the RTACC group, time from guide-wire insertion to balloon inflation at Zone 1 (just above diaphragm) for the REBOA group, and length of time required for CFA cannulation prior to REBOA. Time to common femoral artery (CFA) cannulation for REBOA by percutaneous or open methods was also compared.

Results: During the study period, 18 RTACC and 21 REBOAs were performed. There was no significant difference in age or gender between the two groups. There was no significant difference in procedure times between the 8 clamshell and 10 left side-only thoracotomies (376±188s vs. 361±144s; p = 0.85). Mean time from initial skin incision to aortic cross clamping in the RTACC group was 370- +165 seconds, while mean time from start of arterial access to Zone 1 balloon occlusion was 492+/-107s (vs. RTACC, p=0.0084). All REBOA procedures were performed with the same device which requires a guidewire platform and large arterial sheath. The mean time to complete CFA cannulation was 252+/-112s, with no difference between percutaneous or open procedures access (p = 0.74). The mean time to aortic occlusion in REBOA once arterial access had been established was 240+/- 81s, which was significantly shorter than RTACC (p = 0.0031). There was no difference in mortality between RTACC and REBOA. Trainees performed the procedures in 3 cases (14%) for REBOA and 2 cases (11%) for RTACC.

Conclusion: Time to aortic occlusion, once CFA is achieved, is faster with REBOA, emphasizing the importance of rapid and accurate CFA access. Time to aortic occlusion is also less than the time required to cannulate the CFA either by percutaneous or open approaches. REBOA may represent a feasible alternative to thoracotomy for aortic occlusion in the hands of physicians who are highly skilled at arterial access procedures. Time to aortic occlusion once CFA is achieved will likely decrease with the advent of newer technology that eliminates the need for a long guidewire platform. The rate-limiting and longest portion of the REBOA will continue to be obtaining CFA access.

Poster # 48

VITAMIN D BINDING PROTEIN (DBP) DEFICIENCY INDUCES A REPARATIVE SYSTEMIC CYTOKINE PROFILE FOLLOWING ACUTE MUSCLE INJURY

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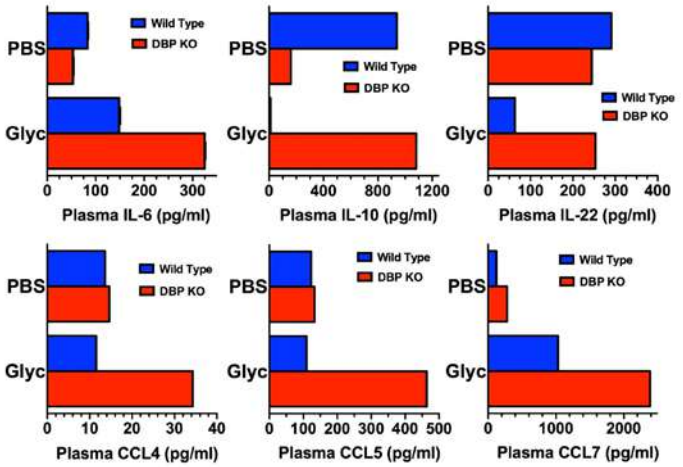
Introduction Severe trauma results in massive cell damage and death at the site of injury causing the release of intracellular contents into extracellular fluids. This results in the release of intracellular actin, which complexes with DBP in the blood and extracellular fluid. DBP-actin complexes are among the earliest markers of tissue damage However, the effects of these complexes on systemic cytokine levels is not known.
Methods Ten-week old C57BL/6 wild-type (DBP+/+) and DBP deficient (DBP-/-) mice, received intramuscular (i.m.) injections of either 50% glycerol or phosphate-buffered saline (PBS) into the thigh muscles. Muscle injury was assessed on H&E stained slides. Select cytokine levels were examined in pooled plasma samples using a multiplex ELISA (n=8 per group).
Results All animals survived the procedure. Harvested thigh muscles from the side of injection in glycerol treated wild-type and DBP-/- mice demonstrated disruption and lysis of skeletal myocytes and an inflammatory cell infiltrate. At 48 hours following i.m. glycerol injection, DBP-/- mice had higher pooled plasma levels of IL-6 (2x), IL-10 (10x) and IL-22 (5x), and CCL4 (3x), CCL5 (4x), and CCL7 (2x) than wild-type mice (see figure). PBS injection demonstrated systemic cytokine alterations that were relatively comparable to those in DBP-/- mice, with the exception of IL-10.



Conclusion: Glycerol induced acute muscle injury triggered a systemic pro-inflammatory response as noted by marked increases in IL-6 in both wild-type and DBP-/- mice. Mice with a systemic DBP deficiency (DBP-/-), and therefore lacking the ability to generate DBP-actin complexes, demonstrated a change in their cytokine profile 48 hours after injury to a more anti-inflammatory (higher levels of IL-10 and IL-22) and pro-resolution/reparative phenotype (higher levels of CCL4, CCL5, CCL7).

Poster # 49

THE TRAUMA CENTER IS TOO LATE: SEVERE EXTREMITY INJURIES WITHOUT A PRE-HOSPITAL TOURNIQUET HAVE INCREASED DEATH FROM HEMORRHAGE

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Introduction: The US military recommends early prehospital (PH) placement of extremity tourniquets as a means of rapid, effective and lifesaving hemorrhage control. The Hartford Consensus encourages the use of PH tourniquets to prevent exsanguination from extremity injuries. However, other groups have held off making similar recommendations, largely because of concerns that the pattern and rate of severe extremity injury seen in civilian trauma centers does not justify widespread use of PH tourniquets. Based on the compelling military data, we placed PH tourniquets into use in 2008. We hypothesized that trauma center (TC) tourniquet use would increase hemorrhage-related death compared to PH placement.

Methods: This was a retrospective study of all patients arriving to a Level-1, urban TC between 10/2008 and 01/2016 with a tourniquet placed prior to (T-PH) or after arrival to the TC (T-TC). Cases were assigned the following designations: *absolute* indication (operation within 2 hours for extremity injury, vascular injury requiring repair/ligation, or traumatic amputation), *relative* indication (major musculoskeletal/soft-tissue injury requiring operation >2 hours after arrival, documented large blood loss), *non-indicated*. Patients with *absolute* or *relative* indications were designated as *indicated*. Outcome included hemorrhage-related death. Continuous values are expressed as median (IQR) and comparisons between groups were performed using the Wilcoxon rank-sum test. Categorical values are expressed as proportions and tested for significance using chi-squared or Fisher's exact tests. Following univariate analysis, logistic regression was carried out to assess independent predictors of hemorrhage-related mortality.

Results: 306 patients received 326 tourniquets for injuries to 157 upper and 147 lower extremities. 278 (91%) had an indication for placement, 249 T-PH and 29 T-TC. Reasons for T-TC placement included active extremity bleeding with hypotension (56%), without hypotension (26%), ACLS in progress (11%), and unknown (7%). Demographic, TC physiologic/laboratory, and injury data for the two groups is displayed in the TABLE. Rates of arterial injury (39%, p=0.9), amputation (25%, p=0.2) and compartment syndrome (1.8%, p=0.4) were equivalent. Hemorrhage-related death was significantly greater in the T-TC group (13.8% vs. 2.4%, p=0.01). When controlling for year of admission, mechanism of injury, arrival physiology and shock (base deficit), patients who had their tourniquet placed at the TC had an 8.5-fold increased odds of hemorrhage-related mortality compared to those who had theirs placed in PH setting [OR 8.5 95% CI 1.1-68.9, p=0.04].

	T-PH (n = 249)	T-TC (n = 29)	*p* value
Age (years)	33 (25, 46)	33 (25, 46)	0.97
Male (%)	83.53	93.1	0.17
Caucasian (%)	46.99	44.83	0.83
Blunt (%)	71.49	62.07	0.29
Air Transport (%)	63.45	48.28	0.11
ISS	9 (5, 17)	20 (9, 27)	**<0.01**
ΔSBP (mmHg)	1 (-12, 28)	-10 (-22, 3)	**<0.05**
Shock Index	0.79 (0.6, 1.09)	1.13 (0.74, 1.53)	**<0.01**
Base Excess	-4 (-7, -1)	-6 (-12, -1)	0.23
Death-all cause (%)	4.02	13.79	**<0.01**

TABLE

Conclusion: PH tourniquet use in civilians that sustained severe extremity injuries was associated with improved physiologic parameters upon TC arrival and no difference in complications. Delaying tourniquet application until TC arrival is associated with greater than 8-fold increased odds of hemorrhage-related mortality.

Poster # 50

NON-FATAL MOTORCYCLE CRASHES: AN OPPORTUNITY TO TEACH SAFETY

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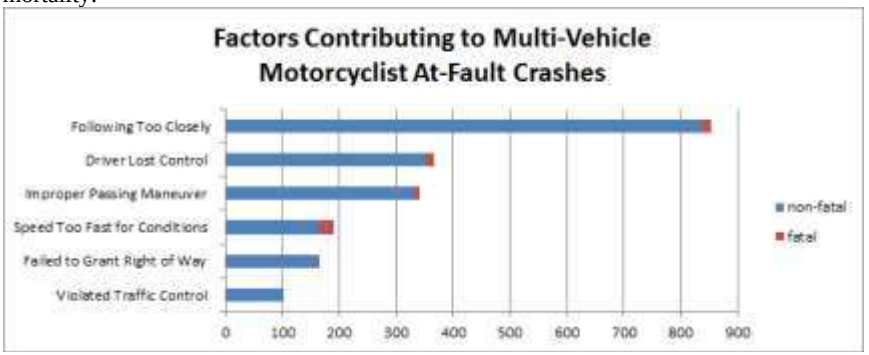
Introduction: While motorcycle riders have a significant risk of death when involved in a crash, many survive. Alcohol impairs motorcycle driving ability, even at blood alcohol levels as low as 0.02%. Drivers and passengers who have been involved in crashes while impaired are at risk for driving impaired in the future. Hospitalization decreases law enforcement's identification of drivers impaired by drugs and alcohol. We sought to analyze motorcyclists who were involved in crashes and determine rates of intoxication as identified in the Connecticut Crash Repository.

Methods: Data for all crashes that involved motorcycles between 2009 and 2014 was downloaded from the Connecticut Crash Repository. The data was analyzed using R (R Foundation for Statistical Computing, Vienna, Austria).

Results: Between 2009 and 2014, there were a total of 8501 crashes involving 9439 motorcycle riders. Three percent (321/9439) of the riders were fatally injured. In 37% (3175/8501) of the crashes, only a single motorcycle and no other vehicle was involved. Of the 5326 crashes involving multiple vehicles, the motorcyclist was found to be at fault 44% (2363/5326) of the time and "following too closely" was the most common factor, contributing to 36% (853/2363) of these crashes. Overall, 57% (5350/9439) of motorcyclists were not wearing a helmet. Similarly, 57% (5157/9118) of the motorcycle riders who survived after a crash were not wearing helmets.

The motorcycle driver was recorded to be intoxicated with drugs or alcohol in 31% (98/321) of the fatal crashes vs 2% (202/9118) of the non-fatal crashes ($p < 0.0001$). Of fatal crashes involving only a single motorcycle, the motorcycle driver was intoxicated 42% (57/80) of the time vs 22% (41/143) of multi-vehicle fatal crashes ($p < 0.001$).

Conclusion: While a majority of intoxicated motorcycle crash victims survive, this leaves them at risk for recidivism. The data suggest that drugs and/or alcohol are a factor in a significant percent of fatal motorcycle crashes and so, motorcyclists at risk for impaired driving must be identified. Efforts to improve safe motorcycle riding such as substance abuse counseling, defensive driving and education about motorcycle helmets could then be focused on this at-risk population and potentially decrease mortality.



Poster # 51

Mild Traumatic Brain Injuries Can Be Safely Managed Without Neurosurgical Consultation: The end of a neurosurgical "Nonsult"?

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Introduction: In 2010, 2.5 million people sustained a traumatic brain injury (TBI), with an estimated 75% being mild TBI. Mild TBI is defined as a Glasgow Coma Scale (GCS) of 13-15. Recent data and our own institutional experience have shown that these patients may be safely managed without neurosurgical consultation. The aim of this study is to prospectively determine the safety of this practice.

Methods: All trauma patients admitted to a single Level I trauma center from June 2014 through July 2015 age 18 or older were evaluated. Those patients with a GCS >14, regardless of intoxication, with an epidural or subdural hematoma <4mm, trace or small subarachnoid hemorrhage (SAH), and/or non-displaced skull fracture were eligible for enrollment. Exclusion criteria included patients on any anticoagulant or antiplatelet agent except aspirin, regardless of dosage. Patients were prospectively followed for the primary outcome of need for neurosurgical intervention. Secondary outcomes included need for neurosurgical consultation, readmission rate, and mortality rate at 30 days post discharge.

Results: Of 1341 trauma admits, 77 patients met inclusion criteria. The mean patient age was 55.2 years and the mean Injury Severity Score was 15.6. Outpatient follow-up was achieved with 75/77 (97.4%) patients. No patients required neurosurgical intervention. Only 1/75 (1.3%) required neurosurgical consultation. The direct healthcare savings from avoiding consultation was $16,129.48. No mortalities were observed. The majority of patients (62.3%) were admitted to the floor with a mean overall length of stay of 2 days. No patient required re-admission and there was no major neurologic morbidity in any patient. A subset analysis of 21 patients on aspirin demonstrated no patients requiring neurosurgical intervention and only 1/21 (4.8%) receiving neurosurgical consultation with no mortalities observed at follow-up.

Initial Head CT Scan

Characteristics n (%)	n=77*
Subarachnoid Hemorrhage	47 (61%)
Subdural Hematoma	33 (42.9%)
Size, mean (sd)	2.8 (1.0)
Intraparenchymal Hemorrhage	12 (15.6%)
Size, mean (sd)	3.1, (0.9)
Skull Fracture	11 (14.3%)
Epidural Hematoma	0 (0%)

Note: size measured in mm
*103 injuries in 77 patients

Table 4. Patient Outcomes

Characteristics n (%)	n=77
Mortality	0 (0%)
Neurosurgical Management	
Intervention	0 (0%)
Consult	1 (1.3%)
Morbidity	
Major neurologic	0 (0%)
Concussion symptoms	12 (16%)
Length of Stay, mean (sd), range	2 (1.8), 0-9
Admission Location	
Floor	48 (62.3%)
NIU	25 (32.5%)
SICU	4 (5.2%)
Disposition of Discharge	
Home	64 (83.1%)
Rehab/Post-acute facility	13 (16.9%)
Return to ER, n (%)	2 (2.6%)
Re-admissions, n (%)	0 (0%)

*Note: 2 patients were unavailable for follow-up
Length of stay measured in days

Patients taking Aspirin

Characteristics n (%)	n=21 (27 injuries)
Mortality	0 (0%)
Neurosurgical Management	
Intervention	0 (0%)
Consult	1 (4.8%)
Morbidity	
Major neurologic	0 (0%)
Concussion symptoms	2 (9.5%)
Length of Stay, mean (sd), range	2.9 (2.1), 1-9
Admission Location	
Floor	11 (50.0%)
NIU	8 (38.1%)
SICU	2 (9.5%)
Disposition of Discharge	
Home	13 (61.9%)
Rehab/Post-acute facility	8 (38.1%)
Return to ER	0 (0%)
Re-admissions	0 (0%)

Note: 1 patient was unavailable for follow-up

Conclusion: The management of patients with a GCS >14 and SDH/IPH < 4mm, small subarachnoid hemorrhage, and non-displaced skull fracture can be safely accomplished by trauma/acute care surgeons without neurosurgical consultation and is associated with both financial and resource savings. Future larger prospective studies regarding patients on aspirin must be undertaken to ascertain if these patients can be safely managed without neurosurgical consultation.

Poster # 52

CORRECTION OF PLATELET DYSFUNCTION IN PATIENTS WITH TRAUMATIC BRAIN INJURY

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Introduction: Platelet adenosine diphosphate (ADP) inhibition is a known contributor to coagulopathy in traumatic brain injury (TBI). We hypothesized that platelet transfusion could reverse the ADP receptor inhibition in patients following TBI.
Methods: Patients admitted with TBI to our level I trauma center (April 2015 – November 2015) were retrospectively reviewed. Platelet mapping thromboelastography (PM-TEG) was obtained in patients with GCS < 13. Patients with ADP inhibition (> 60% inhibition) were transfused platelets (1 apheresis unit). Repeat PM-TEG and transfusion was completed until inhibition was corrected (<60% ADP inhibition) (maximum 3 units).
Results: 79 patients were included, 67.1% male (n=53), 32.9% female (n=26), age = 50.3 ± 22.4 years. Most common injury mechanisms were fall (32.9%), motor vehicle collision (25.3%), pedestrian struck (12.6%). Initial GCS = 7.31 ± 4.8, Injury Severity Score (ISS) = 23.5 ± 11.8. Injuries included subdural hematoma (58.2%), subarachnoid hemorrhage (55.7%), intraparenchymal hemorrhage/contusion (44.3%) and epidural hematoma (6.3%). Neurosurgical intervention (decompressive craniectomy or intracranial pressure monitor) occurred in 45.5%. Use of pre-injury antiplatelet therapy (clopidogrel, ASA) was present in 29.1% (n=23) of patients. Overall mortality was 35.4% (36.1% in inhibited patients, 25.1% in uninhibited patients). Mean ADP inhibition for all patients weas 67.9%. Of the 47 (59.4%) patients with ADP inhibition, 19 completed the protocol. Reasons for not completing protocol included lack of patient availability (OR, radiology), delay in availability of TEG data, patient death and misinterpretation of data in the EMR. Sixteen of the 19 (85%) corrected with platelet transfusion (10 after 1 unit, 5 after 2 units, 1 after 3 units; average 1.4 units). One of the 3 patients who did not correct died.
Conclusion: Platelet receptor inhibition can be reversed following platelet transfusion to correct coagulopathy in traumatic brain injury.

Poster # 53

DOES EARLY BETA-BLOCKADE IN TRAUMATIC BRAIN INJURY REDUCE THE RISK OF POST TRAUMATIC DEPRESSION?

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Introduction: Depression occurs in up to half of trauma patients and negatively impacts on functional outcome and quality of life. Pontine noradrenaline has been shown to increase upon trauma and associated β-adrenergic receptor activation appears to consolidate memory formation of traumatic events. Blocking adrenergic activity reduces physiological stress response during recall of traumatic memories and impairs memory recollection. This implies a potential therapeutic role of β-blockers in these instances. We set out to examine the effect of pre-admission β-blockade on post-traumatic depression.

Methods: All adult trauma patients (≥18 years) with severe isolated traumatic brain injury (intracranial AIS ≥3 and extracranial AIS<3) were recruited from the trauma registry of an urban university hospital between 2007-2011. Exclusion criteria included in-hospital deaths and patients prescribed anti-depressants up to one year prior to admission. Pre- and post-admission β-blocker and anti-depressant therapy data was requested from the national drugs registry. "Post-traumatic depression" was defined as prescription of anti-depressants within one year of trauma. Patients with and without pre-admission β-blockers were matched 1:1 by age, gender, Glasgow Coma Scale, Injury Severity Score, Intracranial Abbreviated Injury Scale (AIS) score. Analyses were carried out using McNemar's and Student's t-test for categorical and continuous data, respectively.

Results: Overall, a total of 545 patients met the study criteria. Of these, 14.7% (n=80) was prescribed β-blockers pre-admission. After propensity matching, 80 matched pairs were analyzed. 32.5% (n=26) of non β-blocked patients developed post-traumatic depression while this reduced to only 17.5% (n=14) in the β-blocked group (p=0.04). There was no significant difference in ICU (mean days: 5 ±7 vs. 6 ±11, p=0.5) or hospital length of stay (mean days: 20 ±22 vs. 21 ±21, p=0.8) between the cohorts.

Conclusion: Pre-admission β-blockade appears to act prophylactically, and significantly reduces the risk of post-traumatic depression.

Poster # 54

THROMBOEMBOLISM FOLLOWING CESSATION OF WARFARIN CHEMOPROPHYLAXIS FOR ATRIAL FIBRILLATION (AF) IN PATIENTS WHO SUSTAINED MILD TO MODERATE TRAUMATIC BRAIN INJURY (TBI)

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Introduction: In patients with TBI, the safe interval between systemic AC reversal with its risk of embolic stroke, and AC restart with possible CNS rebleeding has not been established. The thromboembolic outcome of AF patients is examined in this study.

Methods: 103 patients taking warfarin for AF who had sustained a non-penetrating moderate TBI between January 1, 2010 and January 1, 2015 were assessed by review of their electronic medical record (EMR) all CT imaging for a period of 6-months post injury. Demographics, comorbidities, mechanism of injury, admission INR, GCS, CHA2DS2-VASc scores, date and type of INR reversal drugs used, and date and nature of any thromboembolic events were recorded. All patients underwent repeat CT imaging within 24 hours of injury, and after re-initiation of systemic AC. Prophylactic AC for DVT was started within 3-5 days of TBI.

Results: The mean age was 77.6 ± 10.6 years. Admission INR was 2.8 ± 1.2. The CHA2DS2-VASc score was 4.2 ±1.7. Warfarin was reversed within 12 hours in 97 patients using vitamin K/fresh frozen plasma (FFP) in 47 patients, or with prothrombin complex concentrate (PCC)/vitamin K in 50 patients. Ninety-eight patients survived to hospital discharge and 5 patients died. Eighty-eight patients were discharged to home or to a neuro-rehabilitation center. Ten patients were discharged to a chronic nursing facility or Hospice. The average hospital length of stay (LOS) was 7.9 ± 7.7 days. Warfarin or a substitute (eg. Plavix) was restarted in 41 patients 2 -106 days following its reversal (mean 27.9 ± 34.3 days). None rebled. Warfarin was not restarted in 62 patients due to a history of repeated falls, in-hospital death or excessive risk. Fourteen patients sustained thromboembolism 2 - 100 days following reversal of anticoagulation (mean 19.9 ± 35.1 days). There were three DVT/PE's and eleven cerebrovascular events. Of the fourteen occurrences, twelve had their onset within 17 days of warfarin reversal which was equally divided between FFP/vitamin K and PCC/vitamin K. Re-initiation of systemic AC in the 14 thromboembolic patients occurred 27.6 ± 25.2 days following TBI and warfarin reversal. The admission INR (2.9 ± 1.5) and the CHA 2DS2-VASc score (4.2 ± 2.2) of the 14 was the same as those without these events.

Conclusions: In this study, the cerebrovascular event rate was high and occurred early following injury and AC reversal. Strategies for earlier resumption of AC in patients with stable CT imaging and no contraindication should be encouraged.

Poster # 55

THE GERIATRIC TRAUMATIC BRAIN INJURY ON ASPIRIN: DOES PLATELET TRANSFUSION MATTER?

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Introduction: Platelet transfusion is increasingly utilized in patients with traumatic intracranial hemorrhage (ICH) who are on aspirin or clopidogrel to minimize progression of intracranial bleeding. Currently, there is no defined standard of care specifically regarding the management of platelet induced dysfunction from antiplatelet agents in this population. Our hypothesis is that platelet transfusion in this cohort of patients does not affect platelet function or impact bleed progression.

Methods: This is a prospective interventional trial enrolling patients on daily aspirin with traumatic ICH diagnosed by brain computed tomography (CT). All patients received 1 pack of apheresis platelets within 2 hours of injury. Platelet function was assessed utilizing Verify Now Assay® on blood samples collected before and then one hour after platelet transfusion. The cutoff for functioning platelets was defined as $\geq$ 550 standardized Aspirin Reaction Units (ARU).

Results: A total of 34 patients were enrolled with a mean age of 80.5 (range, 54-97), 65% female, median Glasgow Coma Scale (GCS) score of 15 (range, 9-15), and median head Abbreviated Injury Score (h-AIS) of 3 (range, 2-5). After platelet transfusion, 14 of 34 (41%, 95% CI 25-59%) patients responded by converting to functional platelet status by ARU measurement. Progression of ICH occurred in 14 out of 34 (41%, 95% CI 25-59%) of patients. There was no association between responder status and ICH progression (7 out of 14 of non responders vs 7 out of 20 of responders, p=0.4). In addition, pre-transfusion ARU, ARU difference (posttransfusion-pretransfusion ARU), dual platelet therapy with clopidogrel, admission platelet count and GCS were also not associated with ICH progression on repeat brain CT. Only h-AIS was associated with ICH progression (median 4 vs 3, p=0.04).

Conclusion: Progression of traumatic ICH occurred commonly in patients with dysfunctional platelet function secondary to preinjury antiplatelet therapy as measured by the Verify Now Assay® despite platelet transfusion. Reversal of platelet dysfunction as measured by ARU was not associated with stability of the initial ICH. Further randomized trials are needed to evaluate the utility of platelet transfusion in this subset of patients.

Poster # 56

PLASMA OF SUBARACHNOID HEMORRHAGE AND REVERSIBLE CEREBRAL VASOCONSTRICTION SYNDROME PATIENTS INCREASES BRAIN ENDOTHELIAL PERMEABILITY IN VITRO

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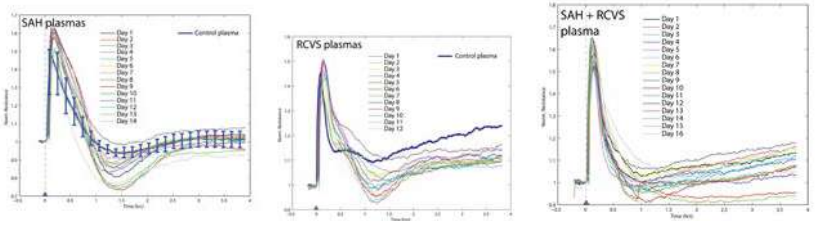
Introduction: Traumatic injury is a leading cause of Subarachnoid Hemorrhage (SAH) and has been associated with cerebral vasospasm. The prognosis after SAH is poor. Reversible Cerebral Vasoconstriction Syndrome (RCVS) is another condition associated with cerebral vasospasm; the prognosis for most patients with RCVS is good, but some may experience permanent deficits due to hemorrhage or ischemic stroke. The underlying pathophysiology and predictors of these complications remain unknown. The aim of this investigations was to evaluate the ability of SAH and RCVS patient plasma to alter endothelial permeability.

Methods: Heparinized plasma was obtained from admitted patients with SAH or RCVS at a Level 1 trauma center. Primary human brain endothelial cells were then grown on impedance sensing chambers under standard culturing conditions. When functional barrier was achieved, the cells were challenged with sterile filtered plasma samples and trans-endothelial resistance was measured for 24 hours.

Results: During the course of stay, temporal changes in SAH and RCVS patient plasma were observed that altered brain endothelial barrier function *in vitro*. These fluctuations in vascular permeability proved dynamic, with periods of recovery followed by drops in resistance across the monolayers that correspond with increased permeability.

Conclusion: Systemic factors exist in the plasma of these patients that can increase permeability of cultured brain endothelial cells. These findings represent a first attempt to understand the pathology as well as aid in the surveillance and intervention of debilitating events. Elucidation of the factors driving the changes in permeability seen in these assays may help identify predictive markers for cerebral vasospasm and vascular leak.



Poster # 57

Early volume changes in hippocampus area demonstrated using VSRAD program appears to be advantage for clinical acute care physicians to predict the reduction of daily activity following moderate head trauma

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Introduction: The objective evaluation of the changes in volume of hippocampus area (VOH) following traumatic brain injury (TBI) can be demanding for acute care physicians. This study aimed to investigate the relation of VOH changes in acute phase and the relation of daily activity following moderate TBI using the voxel-based specific regional analysis system for Alzheimer's disease (VSRAD) advance program.
Methods: After obtaining appropriate approval from the institutional committee, a retrospective study of patients with moderate TBI over a period of 1.5 years was carried out. Moderate TBI defined as Glasgow Coma Scale (GCS) score of 8-12. Patients aged ≤12 years or those with GCS score < 8 were excluded. Three-dimensional FLAIR sagittal magnetic resonance imaging (MRI) evaluation was carried out within 3 days as control, and at 10 days and 30 days after injury in each patient. VSRAD program is designed to evaluate the VOH from the visual information by MRI, and to compare the brain image database between individual patients and healthy volunteers (control) using voxel-based morphometry (*Z score*).
Z score = {[Control mean] – [individual value]} / Control SD
We used the VSRAD program to analyze the data from MRI images and assess the degree of VOH. Neurological outcome was evaluated at 3 months after injury using modified Rankin Scale (mRS) score.

The degree of volume of hippocampus changes (Z score)	
0 ~ 1	No reduction
1 ~ 2	Mild reduction
2 ~ 3	Moderate reduction
3 ≦	Severe reduction
Z score = {[Control mean] - [individual mean]} / Control SD	

Results: This study comprised 26 patients who had moderate TBI with a mean age of 68 years and initial GCS score of 12. All of patients lived independently before injury. The most common type of injury was brain contusion at frontal lobe. The reduction of daily activity at 3 months after injury were determined in 8 patients with mRS 4-5 and a median *Z score* within 3 days was 2.5 (interquartile range, 1.9-4.5). The severity of VOH changes at 10 days compared with that within 3 days in patients with impaired daily activity was significantly higher than that in patients with normal activity. (Table) Intractable epilepsy after injury was determined in 1 patient with impaired daily activity.

	Patients with moderate TBI	
Characteristics	Reduction of daily activity (+)	Reduction of daily activity (−)
Patients, n	8	18
Appearance of brain contusion, n (%)	6 (75)	14 (78)
Z score within 3 days after injury	2.5 (1.9 - 4.5)*	1.4 (0.9 - 2.1)
Severity of VOH changes		
Z score 10 days / Z score <3days	1.1 (1.0 - 1.2)*	0.9 (0.7 - 1.0)
Z score 30 days / Z score <3days	1.1 (1.0 - 1.1)	0.8 (0.8 - 1.0)

TBI, traumatic brain injury; VOH, volume of hippocampus

Conclusion: VSRAD advance program appears to be significantly advantage for acute care physicians to evaluate the early changes in volume of hippocampus area. Further, appearance of acute reduction of VOH suggests the reduction of daily activity and may require earlier rehabilitation.

Poster # 58

MORTALITY FROM COMBAT-RELATED TRAUMATIC BRAIN INJURY (TBI) IS BEST PREDICTED BY THE MILITARY INJURY SEVERITY SCORE (mISS)

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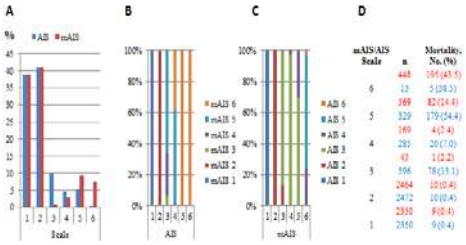
Introduction: Traumatic injuries to the head/neck have been higher during combat operations in this century (30%) than they were compared to the Vietnam War (16%) and World War II (21%). The recent wars in the Middle East have resulted in this higher rate of traumatic brain injury (TBI) secondary to increased exposure to explosive injuries resulting from improvised explosive devices (IEDs), mortar, mines and rocket-propelled grenades. The severity of TBI secondary to these mechanisms can be difficult to assess using accepted standards such as Injury Severity Score (ISS) and Glasgow Coma Scale (GCS); therefore, prognostication in this patient population can be a challenge. Our group has previously validated the military injury scoring system (mAIS and mISS). In this study we evaluated the mISS as a potentially better predictor of mortality for combat-related traumatic brain injury.

Methods: A retrospective analysis was conducted. Data from the DoD Trauma Registry was extracted from 1/2003 to 12/ 2014. Inclusion criteria were: U.S. service members wounded in OEF or OIF; presence of TBI defined by ICD-9 codes; had both AIS and mAIS data; and no evidence of other major injury (AIS≤2 or mAIS ≤2 for the other body regions). The mISS and ISS were calculated by the sum of the squares of the three highest mAIS scores using the AIS-2005 Military criteria (mAIS) for mISS and AIS-2005 criteria (AIS) for ISS, respectively. The primary outcome measure was mortality. Descriptive analyses were performed with the Mann-Whitney, t-test and Chi-square tests where appropriate. Logistic regression was used to calculate the likelihood of mortality associated with level of mISS and ISS in military TBI population. Area under the ROC curve (AUROC) and Hosmer-Lemeshow test were used compare mISS and ISS.



Results: 6045 TBI patients were analyzed with 97.3% male and a mean (±SD) age of 25.8 (±6.3). Mean head/neck mAIS and AIS were similar, 2.3 (±1.6) and 2.0 (±1.1), respectively, but AIS scales were shifted ≥1 scales in the mAIS scale. Severe TBI patients with mAIS of 5 and 6 included mild TBI patients categorized in AIS of 1-4 as seen in Panel A-C. Overall difference between the mean of mISS and ISS were small, 12.5 and 7.5; however, discordant scores between mISS and ISS was 19.4%, accounting for 90.7% deaths. Mortality rate was 5.0% (n=301) with a disproportional death rate in AIS scales of 3, 4, and 5 compared to the mAIS, 13.1 vs. 2.2, 7.0 vs. 2.4 and 54.4 vs. 14.4, respectively (Panel D). AUROC was 0.91 (0.89-0.93) for mISS and 0.88 (0.86-0.91) for ISS.

Conclusion: mAIS improves accuracy for diagnosis of TBI in the combat casualty population; additionally, mISS is a better predictor of mortality from brain injury.

Poster # 59

TRAUMATIC BRAIN INJURY ALTERS THE GASTROINTESTINAL MICROBIOME

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Background: Traumatic brain injury (TBI) is a leading cause of death in both children and adults with over 1 million cases a year. The microbiome is defined as the collective genomes of the microbes (composed of bacteria, bacteriophage, fungi, protozoa and viruses) that colonize the human body and has been associated with a number of disease states. Systemic insults such as trauma, burn or TBI, elict an inflammatory response that may alter the gastrointestinal (GI) microbiome. Changes in the gut commensals can influence the neurologic system via the brain-gut axis, further affecting outcomes. The objective of this study was to evaluate the GI microbiome in a pre-clinical TBI cortical impact model.

Methods: Sprague Dawley rats (300-400g; n = 10) were anesthetized, placed in a stereotaxic frame, and then underwent a 6mm craniotomy exposing the dura matter. The dura was then impacted directly using a pneumatic impactor. Fecal samples were collected at the following time points: pre-TBI, 2 hrs and 1, 3, and 7 days after injury. DNA was purified from all fecal samples and the 16s rRNA gene was amplified using PCR. Amplicons were sequenced using the Illumina MiSeq Sequencer to characterize the microbiome at each time point. Bacterial diversity analysis and taxonomic classification according to organizational taxonomic units (OTUs; 97% sequence similarity) were performed. Beta-diversity was calculated and STAMP software was used to analyze all data. Analysis of variance was used to make comparisons between time points.

Results: Prior to TBI, GI microbial diversity was similar among the rats. Significant changes in the GI microbiome were evident as early as 2 hrs after TBI as compared to pre-injured samples, with varying trends among the phylogenetic families. There was an initial decrease in OTUs seen in the families of Anaeroplasmataceae, Lachnospiraceae and Verrucomicrobiaceae at 2 hrs with the Lachnospiraceae and Verrucomicrobiaceae returning to baseline levels by 7 days (p values all <0.05). Bacteroidaceae, Enterobacteriaceae, Mogibacteriaceae and Pseudomonadaceae all demonstrated increased levels by 3 days post-TBI with all levels in these families returning to baseline levels by 7 days (p values all <0.05).

Conclusions: The gastrointestinal microbiome is altered in rats subjected to a TBI as early as 2 hrs post-injury in the absence of resuscitation, antibiotics, and analgesics. Changes in the microbiome may represent a novel biomarker to stage TBI severity and predict functional outcome.

Poster # 60

THE IMPACT OF A MULTIMODALITY MONITORING AND GOAL-DIRECTED THERAPY PROTOCOL ON THE OUTCOME OF PATIENTS WITH SEVERE TRAUMATIC BRAIN INJURY: A 5-YEAR SINGLE INSTITUTIONAL EXPERIENCE

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Introduction: Patients with severe traumatic brain injury (sTBI) defined by a Glasgow Coma Scale (GCS) ≤ 8 continue to be treated according to the Brain Trauma Foundation guidelines. On-going controversy remains regarding whether a multimodality monitoring and goal-directed therapy protocol may decrease the mortality of patients with sTBI. This study investigates the impact of a goal-directed multimodality monitoring and therapy protocol (MM&GDTP) on the mortality of patients with sTBI compared to the 14-day mortality predicted by the CrasH model.

Methods: retrospective review of 536 sTBI patients (1/1/2011 to 12/31/2015) with a mean age 50 ± 23, a median GCS 3 (3, 6) who were monitored and treated with a MM&GDTP that included maintenance of normothermia with dry water immersion, brain O2 (PbO2) ≥ 20 mm Hg, ICP ≤ 20 mm Hg, cerebral perfusion pressure (CPP) ≥ 60 mm Hg to keep tissue oxygen saturation (bi-frontal Near-Infrared Spectroscopy- NIRS) ≥ 60%, burst suppression as needed, nutritional support targeted to a Respiratory Quotient (RQ) of 0.83 by day 3, osmotherapy and decompressive craniectomy (DC) when indicated. Data acquired included age, sex, GCS, injury severity score (ISS), Abbreviated Injury Scale Head (AIS-H), CPP, PbO 2, NIRS values, RQ value, nitrogen balance, and mortality. Data, presented as means ± SD and median with IQR, were analyzed with univariate and stepwise logistic regression analysis.

Results: 156/536 (29.1%) patients required DC. The predictive mortality (PM) was 69 ± 19 whereas actual mortality was 168/536 (31.3%), yielding a reduction in mortality ranging from 37% to 54%. There was no difference in the mortality of patients requiring DC as opposed to those who did not require it, 40/156 (25.6%) vs. 128/380 (33.6%), respectively, p=0.91. In the stepwise logistic regression analysis, increasing age, higher AIS-H and the need for craniotomy were risk factors for increased mortality.

Variable	All patients (n=536)	Survivors (n=368)	Non-Survivors (n=168)	P Value
Age	50 ± 23	45 ± 22	61 ± 18	0.001
GCS	3 (3, 4)	3 (3, 6)	3 (3, 3.25)	0.01
ISS	26 ± 12	24 ± 13	31 ± 11	0.001
AIS-H	4 ± 1	4 ± 1	5 ± 1	0.001
CrasH PM	69 ± 19	62 ± 16	82 ± 16	0.001

Conclusion: Based on our 5-year institutional experience, we conclude that a MM&GDTP targeted to specific endpoints can decrease mortality in patients with sTBI.

Poster # 61

THE SATISFIED TRAUMA PATIENT? ANALYSIS OF HCAHPS SCORES IN AN ERA OF PATIENT-CENTERED OUTCOMES

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Introduction: The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey is a national, standardized, publicly reported survey of patients' in-patient hospital care experience that is used for reimbursement and hospital comparisons. We aimed to determine factors associated with poor HCAHPS survey results in order to focus efforts on improving perceived quality in these injured patients.

Methods: All adult trauma patients discharged 6/2012-6/2015 from a single academic medical center were identified from a prospectively collected trauma registry. Patients that met criteria for HCAHPS sampling and returned surveys were included. Scores for overall hospital rating and experience with pain control were dichotomized (high vs low) based on published HCAHPS methodology and analyzed using chi-square and multivariable logistic regression methods.

Results: We identified 2176 eligible trauma patients, of which 9.0% (n=196) returned HCAHPS surveys. Median age was 55 [interquartile range 41-66] and 74.0% were male. Three quarters (75.5%) of patients reported a high hospital rating. Patients with high hospital ratings were older (median 58.5 vs. 47.5 years, $p<0.001$) while patients intoxicated on admission reported lower hospital ratings (57.7% high rating vs. 76.8%, $p=0.04$). There was no difference in hospital rating by gender, transfer status, injury type, ISS, intubation rate, LOS, complications, or payer status (all $p>0.05$). On adjusted analysis including age, ISS, and need for procedural intervention, only age over 60 was independently associated with higher hospital rating (OR 5.9, 95% CI 2.3-14.6, vs. age 18-39). Patients who reported low satisfaction with pain control tended to be younger (median 52 vs 58, $p<0.01$) and were more likely to have been intubated (27.0% vs 14.6%, $p=0.04$) but again there was no difference by gender, transfer status, injury type, ISS, LOS, complications, or payer status ($p>0.05$).

Conclusion: Older trauma patients were more likely to report a higher overall rating of their hospital experience but injury severity, mechanism, and need for operative intervention did not affect scores. This analysis can be used to design initiatives, which attempt to maximize patient perceived quality and reimbursement.

Poster # 62

AN ATTRACTIVE FORCE: REDUCED RISK-ADJUSTED MORTALITY FOR SEVERE TRAUMATIC BRAIN INJURY PATIENTS MANAGED AT MAGNET-DESIGNATED HOSPITALS

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Introduction: We sought to determine whether trauma centers with the performance-driven Magnet recognition nursing credential had improved survival for traumatic brain injury (TBI) patients compared to non-Magnet centers. We hypothesized that Magnet hospitals would have decreased adjusted mortality for moderate (MOD) and severe (SEV) TBI compared to non-MAGNET counterparts.

Methods: All adult (≥18) admissions from 2009-2013 to the 13 Magnet and 17 non-Magnet trauma centers in Pennsylvania with head Abbreviated Injury Scale (AIS) scores ≥3 were extracted from the Pennsylvania Trauma Outcome Study database. Patients presenting dead on arrival or transferred to other facilities were excluded from analysis. The population was separated into moderate (MOD: AIS≥3; GCS9-12) and severe (SEV: AIS≥3; GCS≤8) TBI subgroups. Multilevel mixed-effects logistic regression models accounting for clustering within facilities and controlling for demographics and injury severity assessed the impact of Magnet-designation on mortality.

Results: A total of 7,957 patients met inclusion criteria (3,355 Magnet; 4,602 non-Magnet). TBI patients treated at Magnet centers had a 20% adjusted reduction in mortality compared to non-Magnet counterparts (AOR: 0.80; 95% CU 0.65-0.99; p=0.039), when controlling for age, temperature, systolic blood pressure (SBP), head AIS, ISS, GCS, injury type (penetrating), and admission year. Multilevel analysis on TBI subgroups found SEV treated at Magnet centers had decreased mortality (AOR: 0.78; 95%CI 0.62-0.99; p=0.030), however no significant difference in mortality was seen for MOD (AOR: 0.84; 95%CI 0.62-1.15; p=0.274).

Conclusion: TBI patients managed at Magnet-designated trauma centers had a 20% adjusted reduction in mortality compared to those treated at non-Magnet centers. Sub-analyses found increased survival only in the SEV subgroup, suggesting moderate TBIs can be equally treated at Magnet and non-Magnet centers.

Variable	Adjusted Odds Ratio (95% CI)	p-value
Magnet Hospital	0.80 (0.65-0.99)	0.039
Age	1.05 (1.04-1.05)	<0.001
Temperature	0.93 (0.90-0.95)	<0.001
SBP	1.00 (0.99-1.00)	<0.001
Head AIS	1.31 (1.25-1.38)	<0.001
ISS	1.04 (1.04-1.05)	<0.001
GCS	0.80 (0.78-0.82)	<0.001
Penetrating Injury	8.26 (6.46-10.6)	<0.001
Admission Year	1.05 (1.00-1.10)	0.033
Constant	0.02 (0.01-0.03)	-
N = 7,957		AUROC: 0.82

Poster # 63

CYCLES OF OUR LIVES: THE IMPACT OF AGE ON MOTORCYCLE RELATED INJURIES

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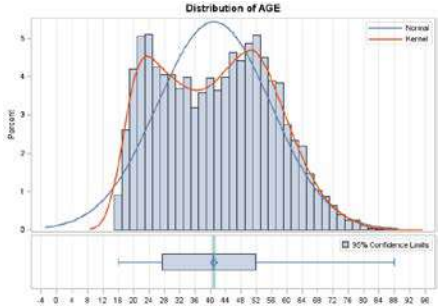
Introduction: Motorcycle crashes (MCC) are believed to be a “disease” of young men. The injuries that result can be a source of significant morbidity and mortality. As the population ages, and older people participate in a variety of recreational activities, injuries are inevitable. We investigated the impact of MCC on the elderly.

Methods: The NTDB National Sample Program Arrival Year 2012 dataset was utilized. Motorcycle accident injuries were defined by ICD-9 e-codes within the range of (810.2 - 823.3) but only containing "motorcyclist" or "passengers on motorcycle". Chi-Squared analysis was used to determine if there is an association between age category (young (YNG) and elderly (ELD)) and several variables of interest, ie helmet use, alcohol use, etc. The age of 55-years was used to define the ELD.



Results: 43,375 patients were included. There were two distinct peaks in age for MCC permitting us to compare YNG and ELD. Both groups were mostly male. Helmet use was more common in ELD (70.9% vs 66.2%, p=0.004). Alcohol use was less common in the ELD (14.4% vs 22.9%, p<0.0001). ELD had a higher frequency of ISS 16-75 (37.6% vs 32.0, p<0.0001) and were more likely to sustain injury to the face, chest, back, and upper extremity (AIS 2-5, p<0.01). ELD more commonly presented with shock (4.3% vs 3.7%), require blood transfusion (14.5% vs 9.4%) had a longer LOS (7.58 d vs 6.28 d), and less frequently were discharged home (61.4% vs 68.7%), p<0.0001. Mortality was higher for ELD (4.3% vs 3.7%, p<0.0001)

Conclusions: A clear bimodal age distribution is demonstrated from these data. Despite having similar body region injuries, elderly patients are sicker, require more resources, and have a higher mortality. These findings may suggest that a different approach to care processes may be warranted for elderly MCC patients. Finally, this may identify a need for a unique injury prevention strategy for this at-risk group of elderly patients.

Poster # 64

INTERNATIONAL EXTERNAL VALIDATION AND NODIFICATION OF THE GERIATRIC TRAUMA OUTCOME SCORE BY JAPAN TRAUMA DATA BANK

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Introduction: The Geriatric Trauma Outcome Score (GTOS) is a user-friendly mortality predicting model developed in US. (J Trauma Acute Care Surg. 2016; 80:204-209) The purpose of this study was to validate and modify this with the sample of Japan Trauma Data Bank (JTDB).

Methods: We used the complete datasets from the JTDB2015 and identified all subjects >65 years of age. Age, ISS, PRBCs transfused in the first 24 hours, and mortality were extracted. The area under the receiver operating characteristic curve (AUC) for the original GTOS formula, where GTOS = [age] + [ISSx2.5] + [22 if transfused any PRBCS by 24 hours after admission], was applied for the sample from JTDB. We constructed the mortality predicting model by logistic regression for the sample of JTDB and estimated the j-GTOS.

Results: From the validation JTDB sample, 45001 subjects were extracted with a median (IQR) age of 78.0(71.0-84.0). Within 24 hours, 6908(15.3%) were transfused PRBC. The median ISS (IQR) was 10.0(9.0-20.0) and the crude mortality was 10.9%. The AUC by the original GTOS for JTDB was 0.841(0.836-0.846). The mortality was estimated by logistic regression as Mortality=-6.686 + 0.034xAge+0.090xISS +0.967[if BT].The j-GTOS was developed as; j-GTOS = [age] + [ISSx2.6] + [28 if transfused]. The AUC by j-GTOS (IQR) was 0.846(0.840-0.852).

	Parkland Sample	Cook AC et al.	JTDB
Age, median (25th IQR, 75th IQR), y	75.5 (69.0–82.0)	76.0 (69.5–82.5)	78.0(71.0-84.0)
ISS, median (25th IQR, 75th IQR)	9.0 (3.0–15.0)	9.0 (3.0–15.0)	10.0(9.0-20.0)
PRBC transfusion at 24 h	11.9%	14.1%	15.2%
Mortality rate	10.8%	11.0%	10.9%
AUC by GTOS (95% CI)	0.819(0.807-0.831)	0.862(0.857-0.867)	0.841(0.836-0.846)

Conclusion: The GTOS was acceptably predicts the mortality with JTDB for the elderly. Further investigation should be needed about j-GTOS.

Poster # 65

POSTINJURY FIBRINOLYSIS PHENOTYPE IS AGE DEPENDENT: GERIATRIC PATIENTS WARRANT PRESUMPTIVE TRANEXAMIC ACID

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OBJECTIVE: Acute fibrinolysis resistance[shutdown(SD)] following severe injury is common and associated with increased risk of organ failure compared to a moderate level of fibrinolysis[physiologic(PY)]. However, elderly patients have increased complications with tPA infusion, and may not benefit from fibrinolytic activity after trauma. The empiric use of antifibrinolytics in trauma remains debated, and we hypothesize that geriatric patients would have a greater potential benefit/risk than younger patients.

METHODS: Retrospective study of two level-1 trauma centers including patients with injury severity score(ISS)>15. Patients were stratified by age: adult(45-64) vs geriatric(≥65); and degree of fibrinolysis(quantified by rapid thrombelastography[rTEG]% clot lysis 30min.): shutdown(SD)<0.8%, physiologic(PY)0.8-2.9%, hyperfibrinolysis(HF)>2.9%, based on pre-existing thresholds.

RESULTS: Of the 1034 patients, 32% were geriatric with a median ISS of 25. Logistic regression controlling for ISS, head injury, blood pressure, and age confirmed increased mortality with HF(p=0.010) compared to SD and a reduction in mortality with PY(p=0.045). Cox regression using the same variable when stratified by age demonstrated increased risk of mortality in HF(1.56 95%CI 1.07-2.33p=0.022) compared to SD and decreased risk with PY(0.65 95%CI 0.43-.96p=0.032). Geriatric patients had increased mortality with HF(1.92 95%CI1.24-3.0p=0.004) compared to SD but not with PY(0.89 95%CI 0.58-1.33p=0.566).

CONCLUSION: Hyperfibrinolysis in geriatric trauma patients is highly lethal and there is no protection from physiologic fibrinolysis. Therefore, empiric tranexamic acid is warranted in geriatric patients, but should be given selectively in younger patients.

*=P<0.05 compared to reference group SD. HF=Hyperfibrinolysis; PY = Physiologic; SD = Shutdown

Poster # 66

EFFECTS OF PATIENT ADMISSION TIME AND TRAUMA SURGEON EXPERIENCE ON INJURY OUTCOMES

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Introduction: The impact of trauma surgeon fatigue during a 24hr in-house call on patient outcomes is unclear. Increasing surgeon experience may mitigate the effects of sleep loss on performance. We hypothesized that earlier time of admission by a more experienced trauma surgeon leads to improved outcomes after injury.

Methods: We conducted a retrospective cohort study using prospectively collected trauma registry and performance improvement data at our Level 1 Trauma Center. Consecutive patients presenting at night from 2013 to 2014 were included. Daytime admissions were excluded to control for differential staffing and resources. Subjects were dichotomized by presentation time into early (6:00 PM-12:00 AM) and late (12:01 AM-7:00 AM) cohorts. Baseline characteristics and clinical variables of the patient cohorts were compared. Second year trauma fellows acting as attendings and staff trauma surgeons were categorized as less and more experienced respectively. The primary study outcome was defined as any complication tracked by our state mandated registry, missed injury, delay in diagnosis, or death. The influence of admission time and trauma surgeon experience on this primary endpoint was examined using multivariate logistic regression accounting for surgeon level clustering.

Results: Overall, 2078 patients presented either during early (n=1189) or late (n=889) night. Compared to early admissions, subjects in the late group were younger (39±18 years vs. 43±20 years, $p<0.005$), more likely to be black (71 vs. 66%, $p=0.02$), and more often sustained penetrating injuries (35% vs. 30%, $p=0.02$). The cohorts were not different with respect to Deyo-Charlson index, insurance status, SBP, GCS, TRISS, or need for surgery. Likewise, no difference in admitting trauma surgeon age, experience, or unadjusted primary study outcome (early 14% vs late 16%, $p=0.206$) was detected between the cohorts. After controlling for patient age, race, Deyo-Charlson index, mechanism, TRISS, admission time and need for surgery, trauma surgeon experience was independently predictive of outcomes. Trauma patients admitted at night by fellows in the attending role were 36% *less* likely to sustain complications or death than those admitted by staff surgeons (adjusted OR 0.64; 95% CI: 0.41-0.99). Importantly, subgroup analysis of early and late cohorts demonstrated this protective effect of fellow care only in patients admitted after midnight ($p=0.03$).

Conclusion: Nighttime initial trauma care by fellows in an attending role was associated with improved outcomes. Our findings suggest that sleep loss may in fact have a greater effect on more experienced trauma surgeons. Further study is warranted to explore the effects of fatigue on trauma surgeons with varying experience levels to determine ideal nighttime trauma staffing models.

Poster # 67

DEVELOPMENT OF SPINAL CORD INJURY SERVICE IMPROVES OUTCOMES AND TRAUMA SERVICE PERFORMANCE

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Introduction: A step-wise multidisciplinary approach to the injured trauma patient has been reported to have an overall benefit to patient outcomes, with reduction in mortality and improved morbidity. The objective of this study was to determine whether the implementation of a dedicated Spinal Cord Injury Service (SCIS) would impact outcomes of a patient specific population on the trauma service.
Methods: During a 5-year period, all spinal cord injury (SCI) patients on the trauma service were reviewed. In 2013, a twice weekly rounding dedicated SCIS was initiated in addition to daily trauma service rounding team. This new multidisciplinary service, the post-SCIS, was compared to the 2011-2012 pre-SCIS. The primary outcome was mortality. The two groups were compared for age, gender, hospital length of stay (HLOS), intensive care unit (ICU) LOS, ventilator free days, and infe
ctious complications.
Results: 95 patients were retrospectively reviewed. Pre-SCIS included 41 patients and 54 patients in the post-SCIS group. The mean age was 46.8 ± 2.36 years, 79% male and 21% female. Analysis of patients in the post-SCIS compared to those of the pre-SCIS revealed shorter HLOS (34.8 vs 23 days, p=0.004), shorter ventilator days (63.3 vs 20.2 days, p<0.001) and less nosocomial infections (22% vs 1.8% , p=0.002). While the mean ICU LOS of post-SCIS implementation was shorter than the pre-SCIS (17.9 vs 12 days, p=0.089), this relationship was not significant. At the same time, analysis of mortality in pre-SCIS showed 5.7 times more likely to expire compared to post-SCIS, however no statistical difference between the two groups was appreciated (odds ratio, 5.73; 95% confidence interval 0.62-53.4; p=0.087).
Conclusion: The application of a SCIS team in addition to the trauma service suggest that a structured coordinated approach to this injury specific patient population can have an expected improvement in hospital outcomes and shorter length of stays. We believe this clinical collaboration provide distinct specialist perspectives and therefore optimize quality improvement.

All Patients	**pre-SCIS *(n=41)***	**post-SCIS *(n=54)***	**p-value**
age	45.9	47.4	
HLOS (d)	34.8	23	0.004
ICU (d)	17.9	12	0.089
Ventilator (d)	49	21	<0.001
Nosocomial infections	9	1	0.002
mortality	4	0	0.087

Poster # 68

LONG-TERM FUNCTIONAL OUTCOMES FOLLOWING BLUNT CEREBROVASCULAR INJURY: A 20-YEAR EXPERIENCE

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Introduction: Since blunt cerebrovascular injury (BCVI) was first recognized over twenty years ago, significant improvements have been made in both diagnosis and treatment. While short-term follow up of these patients has shown that BCVI-related stroke was associated with poor functional outcomes post-discharge, little is known regarding their long-term functional outcomes. The purpose of this study was to evaluate the impact of BCVI on those long-term outcomes.

Methods: All patients with BCVI from 1996-2014 were identified from the trauma registry. Functional outcome was measured using the Boston University Activity Measure for Post-Acute Care (AM-PAC) to assess mobility (normal>84), daily activity (normal>84), and cognitive function (normal>56) via telephone interview. Multiple regression analysis was performed to identify potential predictors of outcome after BCVI.

Results: 509 patients were identified. Overall mortality was 18% (BCVI-related = 1%). Of the 417 survivors, follow-up was obtained in 77 (18%). Mean follow up was 5 years, with a maximum of 19 years. Mean age and injury severity score (ISS) were 47 and 25, respectively. 6 (8%) patients suffered strokes. Mean AM-PAC scores were 59 (mobility), 58 (activity), and 44 (cognitive function), each indicating significant impairment compared to normal. Multiple regression models utilizing age, traumatic brain injury, ISS, and presence of stroke identified age as a predictor of decreased mobility ($b=-0.24$, $p=0.043$), ISS as a predictor of decreased mobility ($b=-0.67$, $p<0.0001$), activity ($b=-0.81$, $p<0.0001$), and cognitive function ($b=-0.28$, $p=0.011$) and stroke as a predictor of decreased activity ($b=-17.8$, $p=0.048$) and cognitive function ($b=-10.6$, $p=0.033$).

Conclusions: Development of stroke and increased injury severity resulted in worse long-term functional outcomes following BCVI. In fact, multiple regression analysis identified both ISS and stroke as independent predictors of significant impairment in both daily activities and cognitive function. Thus stroke prevention with optimal diagnostic and treatment algorithms remains critical in the successful treatment of BCVI as it has significant impact on long-term functional outcomes, and is the only *modifiable* predictor of outcomes in patients following BCVI.

Poster # 69

DETERMINATION OF A PATHWAY FOR MANAGEMENT OF LOW MECHANISM TRAUMATIC INTRACRANIAL HEMORRHAGE

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Introduction: Traditionally at our institution, the majority of patients with isolated intracranial hemorrhage (ICH) sustained from a low energy mechanism (defined as found down, fall from ≤ 6 ft, and assault) were admitted to our Trauma Service, often impacting our surgical intensive care unit (SICU) bed utilization. Through a multidisciplinary workgroup, the "Isolated, Low Energy Mechanism ICH Pathway" was created in which patients are first evaluated by the trauma team to ensure the isolated nature of the ICH and are then admitted to the most appropriate treatment team (Trauma, Internal Medicine, Neurology or Neurosurgery) depending on the global condition of the patient. We hypothesized that this new pathway would improve patient throughput and decrease the burden of primary care by the Trauma Service, while having no impact on outcome.

Methods: All adult patients (age ≥ 18 years) with isolated ICH admitted to University Hospital (UH) were identified by querying the trauma registry between the years of 2008 to 2014. Patients were stratified according to injury severity score (ISS), age and probability of survival (Ps; determined by TRISS). Patients admitted between 2008 and 2010 were placed into a pre-pathway group (PRE), and those admitted between 2012 and 2014 were placed into the post-pathway group (POST). Patients admitted in 2011 were excluded since this was the year the pathway was implemented. Patients within each group were further subdivided by the admitting service (Trauma, Internal Medicine, Neurology and Neurosurgery) for further analysis. The primary outcome was mortality, and the secondary outcomes were length of stay (LOS) and ICU LOS. Outcome was compared between the PRE and POST groups. The ratio of Ps to actual survival (As; 6 month) in each group was also compared between the PRE and POST groups. A student t-test, Fisher's exact t-test and Chi Square test were used to determine associations and differences between groups.

Results: 4088 adult patients with traumatic brain injury (TBI) were admitted between the years of 2008-2014. Of these, 1709 met the low energy mechanism, isolated ICH criteria during our two study periods, with 711 patients in the PRE group and 998 in the POST group. Mean age was higher (61.7 vs 56.7, $p<0.0001$) and ISS was lower in the POST group (17.8 vs 18.8, $p <0.0131$). However, there was no difference between the ratio of Ps to As between the PRE and POST groups (0.92 vs. 0.96, $p= 0.621$), indicating similar risk profiles. The percent of adults with ICH from a low energy mechanism that were admitted to the trauma service decreased from 73% to 37% ($p<0.0001$). There was no difference in overall mortality between the PRE and POST groups (14.0% vs 13.3%, $p = 0.668$). Mean LOS decreased with the pathway from 8.9 days to 5.7 days ($p < 0.0018$), and mean ICU LOS decreased from 4.2 days to 2.6 days ($p < 0.0001$).

Conclusion: Isolated ICH can be safely managed through a multidisciplinary pathway with an improvement in LOS and ICU LOS while not impacting mortality. Our "Isolated, Low Energy Mechanism ICH Pathway" has allowed us to optimize trauma-related resources and reduce costs associated with length of stay and ICU utilization.

Poster # 70

GERIATRIC TRAUMA PATIENTS, PRE-INJURY MEDICATIONS AND COAGULOPATHY

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Introduction: Geriatric trauma is increasing due to demographic changes. Elderly patients can be on medications that can affect thrombostasis and also have trauma induced coagulopathy. In elderly trauma patients presenting to our Level 1 trauma center, we aimed to determine if exposure to preinjury medications affected coagulation parameters at admission or clinical outcomes during the hospitalization.

Methods: After IRB approval, all patients > 65 years presenting as a trauma activation were screened and entered into this prospective cohort study. Each patient had a TEG done along with admission labs for this study. Variables were obtained from the Trauma registry and the medical records and included demographics, mechanism, ISS, medications (specifically ASA, Plavix, warfarin, heparin, novel anticoagulants), initial labs, transfusions within 24h, number of operations, hospital and ICU length of stay and mortality during hospitalization. Data analysis was done with SAS using Fisher's Exact, Wilcoxon Rank and Kruskal-Wallis tests.

Results: A total of 100 patients were entered between July and Dec 2015, 54% were male. Median ISS was 9 (Range: 1 – 43). 51% were on any of the medications of interest (ANY): of which 84% (n=43) were on ASA, 18% on ASA/plavix, 8% on therapeutic anticoagulation. 49% were on none of these medications (NONE). There was a small difference in age between the ANY and NONE groups (Median: 76 (Range: 65 - 97) vs 72 (65 – 97), p=0.0352). There were no differences between the two groups in BMI, ISS, initial PT, INR, PTT levels, transfusions within 24 hours, number of operations, hospital and ICU length of stays and mortality. TEG parameters-- MA and LY30 were significantly different between ANY and NONE groups. MA: Median: 68.8 (Range: 50.5 – 79.4) vs. 66.1 (18.9 – 75.3), p=0.0111. LY30: Median: 0.6 (Range: (0 – 11.7) vs 1.3 (0 – 15.9), p=0.0196. The ANY group was then separated into ASA only and ASA/Plavix groups and compared to the NONE group. Again, there were no differences across these three groups expect in TEG parameters. The MA component of TEG was again significantly larger in ASA only group (Median: 70.3 (Range: 52.5 -79.4) vs 66.1 (18.9 – 75.3), p=0.0207). The LY30 trended toward lower in the ASA only group (Median: 0.5 (Range: 0 – 11.7) vs 1.3 (0 – 15.9), p=0.0566).

Conclusion: Elderly trauma patients on preinjury medications, even ASA, can have signs of hypercoagulability and increased clot lysis based on TEG parameters but without abnormalities in standard coagulation tests. These findings underscore the need for further study on the impact of routine medications on coagulopathy in elderly trauma patients.

Poster # 71

THE RISK OF VENOUS THROMBOEMBOLISM AFTER TRAUMA DESPITE CHEMOPROPHYLAXIS: WHEN "BEST PRACTICE" IS NOT ENOUGH

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Introduction: The hypercoagulable state associated with traumatic injury is a known risk factor the development of deep venous thrombosis (DVT) and pulmonary embolism (PE), collectively referred to as venous thromboembolism (VTE). A small portion of patients, even after receiving prophylaxis, still develop VTE. This study was designed identify those patient characteristics which were associated with the development of VTE after trauma despite chemical prophylaxis.

Methods: A retrospective analysis of national trauma admissions between 2013 and 2014 was performed using the Trauma Quality Improvement Program (TQIP) database. Inclusion criteria included documented use of chemical prophylaxis and length of stay ≥ 3 days. VTE was defined as the development of DVT, PE, or both. Admissions were excluded if VTE complication status was unknown. Bivariate and multivariable analysis were used to predict the development of VTE.

Results: There were 140,141 admissions which met study criteria. Of these admissions, 4,666 patients (3.33%) developed VTE. Based upon a backward elimination logistic regression model, independent risk factors for development of VTE despite prophylaxis were time to initiation of prophylaxis > 48 hours after admission (OR 2.56, p <0.0001), initial GCS < 10 (OR 2.11, p = 0.0003), and BMI > 30 (OR 1.98, p = 0.0007). Injury type, injury severity, and method of chemical prophylaxis did not significantly affect the odds of VTE.

Conclusion: Independent risk factors for developing VTE despite receiving chemical prophylaxis are an initial GCS < 10, BMI > 30, and the initiation of prophylaxis greater than 48 hours after admission. These results suggest that efforts to reduce the incidence of VTE should focus on increased surveillance and initiation of prophylaxis sooner in this population. Furthermore, patients with neurologic impairment, obesity, and/or delays in starting prophylaxis represent a cohort that would benefit from DVT screening.

Poster # 72

REVIEW OF VIDEOTAPED TRAUMA RESUSCITATIONS IMPROVES EFFICACY OF PATIENT CARE

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Introduction: Time is of the essence in care of the critically injured patient. Expedient initial assessment, resuscitation and dispostion of the patient to the operating room (OR), intensive care unit (ICU) or computed tomography (CT) suite improves care. Videotape reviews are used to improve performance in athletics and public speaking. We hypothesized reviewing videotapes of our highest level trauma alerts would improve outcomes at our Level 1 Trauma Center.

Methods: All critically injured patients at our Level 1 Trauma Center who meet our highest level of activation criteria underwent videotaping and timing of their resuscitation in the Trauma Bay (TB) beginning November 2014. These DVDs were reviewed once a week by trauma attendings, trauma chief residents and senior level nursing. Demographics such as age, gender, mechanism of injury, trauma bay dwell times and mortality were recorded.

Results: Over a 15 month period, 432 highest level trauma alerts were videotaped and reviewed. Monthly TB dwell times over the 15 month period are shown in the figure below. Initial TB dwell time was 28.6 +/- 13.2 minutes during the first month. After three months the mean TB time was decreased to 16.6 +/- 7.9 minutes ($p < 0.006$) and 15 months later the mean TB time was 15.8 +/- 8.9 minutes ($p < 0.0001$), both statistically extremely significant. The average TB dwell time has remained constant at 15 min over the last three months and likely represents the optimal mean TB dwell time. The mortality in the first three months of the study was 15.5 % and decreased to 8.8 % during the last three months but this was not statistically significant ($p = 0.19$). Trauma attending response time within 15 minutes remained constant at greater than 93% during each month of the study period. After a survery, all chief residents involved with the process have found reviewing the videos extremely helpful. They all have learned how to be more efficient at TB resuscitations, delegating responsibilities to junior residents and prompt disposition of patients to the OR, ICU or CT scanner.

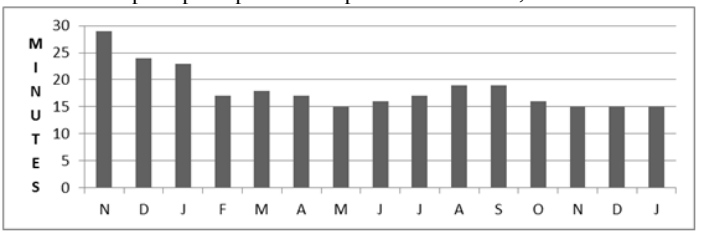

FIGURE 1: TB time vs. Month

Conclusion: The review of videotaped trauma alerts has improved resident leadership and delegation skills. TB dwell times significantly decreased with this technology. Although mortality was not significant decreased, it did appear to improve. TB resuscitations are now much more efficient and organized at our Level 1 Trauma Center. We will continue to review trauma videos with surgical residents on a weekly basis as part of resident education and improved patient care.

Poster # 73

MOVING THE NEEDLE ON RATES OF PERIOPERATIVE DEEP VEIN THROMBOSIS (DVT) AND PULMONARY EMBOLUS (PE) IN NON-TRAUMA PATIENTS: A MULTIDISCIPLINARY PROCESS IMPROVEMENT PROJECT BASED ON A TRAUMA BEST PRACTICE MODEL

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Introduction: Hospital acquired perioperative DVT/PE rates are publicly reported and may affect reimbursement rates from The Centers for Medicare and Medicaid (CMS) in patients undergoing hip and knee replacements. At a busy urban Level 1 trauma center and elective orthopedic surgical hospital, we recognized that our unadjusted DVT/PE rate of 9.19% per 1,000 surgical patient discharges for Fiscal Year 2014 (FY14: July-July) was higher than expected. The trauma service line was noted to have a superior risk adjusted DVT/PE rate as reported in national Trauma Quality Improvement Program (TQIP) data. A process improvement (PI) plan using trauma service policies as a model was initiated throughout the hospital to decrease rates of DVT and PE.

Methods: This Multidisciplinary Team PI project reviewed individual cases of DVT/PE in all surgical patients to assess reasons that rates were higher than expected. Best practice management guidelines were developed for all service lines to follow after reviews of the DVT/PE cases. The PI team, including physicians, pharmacists, therapists, nurses and hospital quality improvement staff, offered recommendations to direct both a practice and culture change. Physician champions from trauma surgery, orthopedic surgery and internal medicine were identified. Protocol changes in the joint replacement patients went into effect November, 2014.

Results: The review documented the following five opportunities for improvement: poor understanding of risk of DVT/PE; non-universal use of sequential compression devices in the operating room; inconsistent use of and under-dosing of enoxaparin; delays in initiation of enoxaparin; and delays in early mobilization. After implementation of the focused PI plan, the overall DVT/PE rate in all surgical patients decreased from 9.19% FY14 to 8.23% FY15 with an additional decrease to 6.99% July through December 2015. This was an overall rate decrease of 24% ($p=0.24$). For patients undergoing total hip or knee joint replacement, the DVT/PE rate decreased from 10% in FY14 and 12.9% in FY15 to 6.2% July through December 2015. ($p=0.25$), an absolute decrease of 52%. Specifically, the DVT/PE rate decreased from 20.3% pre-protocol change to 7.1% post-protocol change in patients undergoing hip or knee joint replacements. ($p=0.04$, OR 2.9)

Conclusion: The DVT/PE hospital wide PI project emphasized a heightened awareness of DVT/PE risk in surgical patients and led to a significant increase in postoperative mobilization, routine mechanical prophylaxis prior to induction of anesthesia, and pharmacological agents based on risk stratification. This PI initiative, modeled on the successful best practices of the trauma service line, produced an improvement in patient care throughout the hospital and most robustly in the elective orthopedic population with a statistically significant decrease in DVT/PE. This will have positive implications for reimbursement from CMS.

Poster # 74

DOUBLE JEOPARDY: IS TRAUMA TEAM ACTIVATION INDICATED FOR ALL INJURED PREGNANT PATIENTS?

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Introduction: Most pregnant trauma patients presenting with significant mechanism or injury will trigger activation of the trauma team (TTA) with obstetrics service support (OB). In contrast, minor trauma in pregnancy may be evaluated only by the obstetrics team with occasional consultation with the trauma service. We theorized that even minor trauma was associated with significant short and long term complications necessitating combined trauma and obstetric service management.
Methods: We retrospectively reviewed our trauma and obstetric service's prospective database for all patients admitted for injury over the most recent 8 year time frame. 486 patients were categorized as primary TTA or OB assessment only. Data of interest included: mechanism of injury/ISS, gestational age at injury, emergency obstetrical complications, and interventions. Late follow-up of maternal and fetal complications during delivery and postpartum were recorded.
Results: Mechanisms of injury: motor vehicular collisions (366, 75%), falls (97, 20%), assault (13, 3%), other (10, 2%). Mean ISS: 2.3 ± 5.5. Mean age: 28.8 ±5.4 years; gestational age 3 - 40 weeks (mean, 26 ± 8.6). 332 (68%) had routine TTA and OB evaluation with fetal monitoring. In contrast, 154 patients (32%) were admitted directly to OB with optional TTA. Late OB complications were frequent (276 patients (57%), with a trend toward more frequent fetal monitoring abnormalities in TTA (p=0.07). Maternal ICU admissions were significantly more common in patients evaluated by the trauma service (p=0.04). Logistic regression analysis showed that motor vehicle collision, third trimester status and TTA predicted increased risk for short term complications (p=0.03).
Conclusions: Our findings suggest that even minor trauma during pregnancy is associated with significant short and long term obstetric and fetal complications, particularly motor vehicle collisions occurring during the third trimester .These data support routine TTA in concert with OB consultation for all injured pregnant patients.

		Trauma Team Activation group (N=332)	Obstetric evaluation group (N=154)	P value
Mechanism N (%)	MVA	298 (90)	68 (44)	<0.0001
	Falls	23 (48)	74 (69)	<0.0001
Gestational age N (%)	Median, weeks	26.4	24.8	0.05
	1st trimester	19 (6)	23 (15)	0.001
	2nd trimester	165 (50)	73 (47)	NS
	3rd trimester	148 (45)	58 (38)	0.016
ISS	Mean ISS	2.27	2.29	NS
Short term complications N (%)	Placental abruption	3 (0.9)	0	NS
	Intrauterine fetal death	2 (0.6)	0	NS
	Emergency CS	3 (0.9)	1 (0.65)	NS
	Preterm labor	2 (0.6)	1 (0.65)	NS
	Maternal ICU admission	11 (3.3)	1 (0.65)	0.04
	Fetal monitoring abnormalities	36 (10.8)	9 (6)	0.07
Late complications (276 patients)	Preterm delivery (< 37 weeks)	33 (18.3)	18 (19)	NS
	Low birth weight (< 2500 g)	14 (8)	7 (7.5)	NS
	5-min Apgar score <7	14 (8)	8 (9)	NS
	Intra-partum fetal death	2 (1.1)	1 (1.1)	NS
	Emergency CS	31 (17)	22 (24)	NS

Poster # 75

VARIABILITY IN COMPUTED TOMOGRAPHY (CT) IMAGING OF TRAUMA PATIENTS AMONG EMERGENCY DEPARTMENT PHYSICIANS (EDP) AND TRAUMA SURGEONS WITH RESPECT TO MISSED INJURIES, RADIATION EXPOSURE AND COST

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Introduction: There is substantial variability in the CT scans desired by EDP, surgical chief residents (SCR) and trauma attending surgeons (TAS). We quantified these differences and studied the effects of each group's decisions on missed injuries, cost, and radiation exposure.

Methods: Over 6 mo at a single urban level 1 trauma center, all blunt trauma activations were studied. After completing the secondary survey, plain films, and focused abdominal sonogram (FAST) exam, the EDP and SCR each completed a form to record desired CT scans (head, cervical spine, face, chest, abdomen/pelvis). The TAS made the final determination regarding scans to be performed. Missed injuries were defined as any not identified by initial imaging for the TAS, and any that would have not been identified properly by the scans desired by the EDP or SCR. Extremity injuries, and injuries obvious on physical exam or visible on plain film were excluded. Radiation dose and cost for desired scans were calculated using the median value for each from the scans actually performed. Fisher exact or chi-square tests for multiple comparisons were used, $p< 0.05$.

Results: TAS ordered significantly more CT scans, 1,012 vs. 882 (EDP) and 884 (SCR) resulting in de facto pan-scan in 78.4% (TAS) vs. 63.7% (EDP) and 68.5% (SCR) (all, $p<0.0001$). This led to higher cost per patient of CT scans by TAS of $344 vs. $267 (EDP) and $292 (SCR) (all, $p<0.0001$). Radiation exposure did not differ (18 mSv (TAS) vs. 13 mSv (EDP) ($p=0.185$) and 15 mSv (SCR) ($p=0.488$). Of total injuries, TAS missed 0.96% whereas EDP missed 10.6% and SCR 7.2% (all, $p<0.0001$). The relative risk of missed injury was 11.0 (95% CI 4.8-25.19) for TAS vs. EDP and 7.5 (95% CI 3.22-17.46) for TAS vs SCR.

Conclusion: TAS utilize CT most liberally and more precisely in blunt trauma patients, resulting in higher cost but no increase in radiation exposure per patient. This is offset by a reduction in the number of injuries missed by TAS, which expedites diagnosis and management and may decant the CT suite, improving access. This could be the result of overreliance on the accuracy of the physical exam or plain films by EDP, as well as inexperience on the part of SCR.

Poster # 76

TRAUMA TRANSITIONAL CARE COORDINATION: PROTECTING THE MOST VULNERABLE TRAUMA PATIENTS FROM HOSPITAL READMISSION

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Introduction: Unplanned hospital readmissions increase health care costs and patient morbidity. We hypothesized that a program designed to reduce trauma readmissions would be effective.

Methods: A Trauma Transitional Care Coordination (TTCC) program was created to support patients at high risk for readmission. Patients were identified prior to discharge via a checklist including: previous readmission, lack of regular home assistance/home care services, poor or absent insurance, new traumatic brain injury, history of psychiatric disease, drug abuse, multiple co-morbidities without a primary care provider (PCP), pulmonary embolism or vascular injury without PCP, new tracheostomy, high output fistula, and large open wounds before definitive closure. TTCC interventions included call to patient (or caregiver) within 72 hours of discharge to identify barriers to care, complete medication reconciliation, coordinate medical appointments or home visits, and individualized problem solving. Information on all 30 day readmissions was collected. Participants completed a ten question quality of life and satisfaction survey. 30 day readmission rates were compared with population based and risk-adjusted rates of readmission using published benchmarks.

Results: 260 patients were enrolled in the TTCC program from 1/14 – 9/15. 33.3% (n=80) of enrollees were uninsured, 45.4% (n=109) reported current substance abuse, 29.1% (n=70) had a current psychiatric diagnosis, and 60% (n=144) had multiple co-morbidities without a PCP. 74% (n=193) attended outpatient trauma appointments within 14 days of discharge. 44% (n=115) attended appointments with new PCPs within 30 days of discharge. 96.3% were successfully followed, only 9 patients lost to follow-up. The majority of patients felt TTCC helped them understand their healthcare and ultimately felt able to care for themselves at their new normal. Only 6.6% (n=16) of patients were readmitted in the first 30 days after discharge as compared to recently published population based trauma readmission rates (6.6% vs. 19%, $p<0.0001$).

Conclusion: A nursing-led TTCC program successfully followed patients and was associated with a significant decrease in 30 day readmission rates for high risk trauma patients. Estimated cost savings for such a reduction nationwide would approach $374 million per year. Targeted outpatient support for those most vulnerable patients can lead to better utilization of outpatient resources, increased patient satisfaction and more consistent attainment of pre-injury level of functioning or better.

Poster # 77

COMPETING RISKS ANALYSIS OF FACTORS ASSOCIATED WITH PULMONARY EMBOLISM AND DEEP VEIN THROMBOSIS AFTER TRAUMATIC INJURY

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Introduction: Recent studies suggest that post-traumatic pulmonary embolism (PE) and deep vein thrombosis (DVT) are distinct clinical processes that share similarities in risk. Less understood is how the timing of diagnosis of a thromboembolic event affects the risk for a future event. By this definition, DVT and PE act as competing events. We hypothesized that risk factors and timing of diagnosis for PE and DVT are different, and evaluated this hypothesis using a competing risks analysis.

Methods: Adult trauma patients admitted to a Level I trauma center between July 2006 and December 2010 who received at least one surveillance duplex sonography (DS) of the lower extremity were included. Outcomes evaluated were DVT and PE, and the time-to-event from admission. Patients without either event were statistically censored at the time of discharge. Competing risks survival analysis was used to evaluate potential risk factors for DVT accounting for PE as a competing event, and vice versa.

Results: Of 2,370 patients who met inclusion criteria, 265 (11.2%) had at least one event: 235 DVT-only, 19 PE-only, 9 DVT with subsequent PE, and 2 PE with subsequent DVT. Mortality rates were 3.3% in non-events, 7.7% for DVT-only, and 15.8% for PE-only ($p<0.001$). There were no deaths among patients with PE and DVT. DVT occurred earlier than PE (median 3 days vs. 4 days, respectively). Competing risks modeling of DVT as the primary event identified older age, severe injury (ISS≥15) mechanical ventilation > 4 days, active cancer, history of DVT or PE, major venous repair, male sex, and both prophylactic lovenox and heparin use as associated risk factors. Modeling of PE as the primary event showed younger age, non-severe injury (ISS<15), central line placement, mechanical prophylaxis, and prophylactic heparin use as relevant factors.

Conclusion: PE had opposite risk factor associations to those for DVT. Both PE and DVT are valid competing events to each other, and a failure to account for each introduces bias in the classification of risk. Results suggest that DVT and PE are distinct clinical events that require independent consideration.

Table. Adjusted sub-hazard ratios (95% confidence intervals) of risk factors for DVT and PE

	DVT Primary Event	PE Primary Event
Risk Factor	**sHR (95% CI)**	**sHR (95% CI)**
Mechanical Prophylaxis	-	0.22 (0.06-0.81)
Age at Admission	1.02 (1.01-1.02)	0.94 (0.90-0.97)
Severe Injury	1.38 (1.01-1.89)	0.27 (0.11-0.67)
Male Sex	1.44 (1.04-1.98)	-
Central Line Placement	-	5.78 (1.60-20.86)
Ventilated > 4 days	2.17 (1.59-2.95)	-
Prophylactic Heparin	2.21 (1.52-3.20)	6.63 (2.25-19.56)
Prophylactic Lovenox	2.44 (1.76-3.38)	-
Active Cancer	2.47 (1.17-5.22)	-
Major Venous Repair	2.82 (1.41-5.65)	-
History of DVT or PE	4.53 (2.71-7.57)	-

Poster # 78

"Delay to OR" Fails to Identify Adverse Outcomes at a Level I Trauma Center

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Introduction: The American College of Surgeons Committee on Trauma designed core process measures to be tracked by trauma centers to identify opportunities for improvement (OFI) and prevent adverse outcomes. "Delay to the OR" is one such measure that is widely monitored but has not been well studied. We sought to evaluate the effectiveness of delay to the OR >2 hours (DOR) to independently identify adverse outcomes and OFI at a Level I trauma center.

Methods: All trauma patients who underwent exploratory laparotomy from July 2006 to March 2015 were reviewed. Patients with DOR were identified and compared to those without DOR. To explore the ability of DOR to independently identify adverse outcomes, DOR patients were further divided into those with DOR only and those with DOR in conjunction with at least one other process measure that triggered review. Primary outcome was a complication identified by peer review. Secondary outcome was an identified OFI. Cases with either outcome underwent medical records review to determine if the complication or OFI resulted directly from DOR.

Results: Of the 472 patients who underwent exploratory laparotomy, 109 (23%) had DOR and 363 (77%) did not. There was no significant difference in age, sex, or injury severity between the two groups. DOR patients were more likely to have blunt injury (71% vs. 38%, $p<0.0001$), a higher mean admission systolic BP (123 vs. 115, $p=0.02$), and longer ICU stay (2 vs. 1 day, $p=0.003$). DOR was associated with three other process measures: failed non-operative management ($p=0.001$), delay in diagnosis ($p<0.0001$), and delay in presentation ($p<0.0001$). The rate of complications identified among DOR patients and those without DOR was not significantly different (35% vs. 38%, $p=0.11$). DOR was the sole flagged process measure in 31(28%) patients. This subgroup had no identified complications but incurred two OFI involving nontrauma personnel: one related to improving accuracy of the diagnostic workup and one aimed at timely resource allocation. Neither was associated with adverse outcomes.

	DOR Only (n=31)	DOR & Other Measures (n=78)	*p*
Adverse Outcome	0 (0%)	38 (49%)	<0.0001
OFI	2 (7%)	12 (16%)	0.34

Conclusion: In patients undergoing exploratory laparotomy, DOR fails to independently identify adverse outcomes. These findings suggest that DOR is not an effective indicator of either suboptimal trauma care or adverse outcomes at a Level I trauma center.

Poster # 79

WHEN MINUTES FLY BY: WHAT IS THE TRUE "GOLDEN HOUR" FOR AIRCARE?

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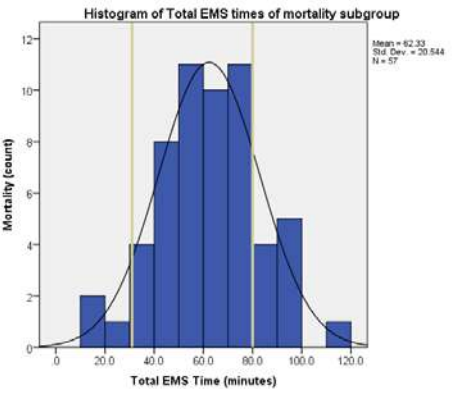
Introduction: The term “golden hour” associates the risk of mortality to the timing of definitive care of trauma patients. A delay of care over an hour has been directly related to poorer outcomes. For this reason, air transport was developed to hasten the transport time of trauma patients. However, no prior civilian studies have determined whether air transport has had any effect on this phenomenon. We hypothesized that total transport time greater than 60 minutes would be associated with increased mortality.

Methods: This was a retrospective, multicenter study of adult (≥18 y/o) trauma patients transported by air between November 2014 and August 2015. Five institutions contributed to the data. Associations between total EMS transport time and mortality were analyzed using logistic regression. An analysis utilizing descriptive statistics and analysis of variance of those who died was also performed.

Results:A total of 636 patients met inclusion criteria. The population was 70.8% male, and primary mechanism of injury was blunt trauma (86%). Median GCS, ISS, and SI were 15, 14, and 0.72, respectively. Median total EMS time was 65 minutes. A total of 57 (9.2%) patients died. Examination of this subgroup revealed a doubling in mortality after 30 minutes, which was significant by ANOVA analysis ($p<0.0001$). Median GCS, ISS, and SI of this group were 3, 26, and 0.83, respectively. Figure 1 demonstrates the total EMS time for those whom died.



Conclusion: When analyzing time sensitive mortality within the “Golden Hour” for air transport, a time cutoff of 30 minutes was associated with higher rates of death. Seemingly, the likelihood for mortality was significantly less if air transport time was within 30 minutes. Pre-hospital Quality and Performance Improvement analysis of those that died within 30-80 minutes is warranted in order to improve outcomes.

Poster # 80

IS IT TIME TO BENCHMARK COMPLICATIONS FROM THE NTDB? A LONGITUDINAL ANALYSIS OF RECENT REPORTING TRENDS

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Introduction: In the era of value-based purchasing, benchmarking schema such as TQIP are increasingly important. TQIP serves as a comparator between trauma centers but does not establish National minimal complication benchmarks for pay for performance. Payers have approached select complications as never-events and there is rational that due to injury and patient characteristics, achieving a zero incidence of these events is impractical. Prior NTDB analysis through 2005 showed high rates (37%) of centers reporting no complication data making National estimates for determining a more rationale never-event benchmark difficult to ascertain. We hypothesized that given the increased interest in never-events, complication reporting in the NTDB would be markedly improved compared with the historic data.

Methods: The 2008-2012 NTDB and NTDB-NSP weighted files were utilized to calculate yearly National estimates. Rates were compared in all centers and in only those reporting complication data. Hospital characteristics were compared using Students t-test.

Results: From 2008-2012, the NTDB contained raw data on 3,657,884 patients. 16.3% (n=594,894) experienced 1 or more complication (82.7% 1; 17.3% 2+). Excluding the 'other complication' category introduced in 2011, the overall weighted rate was 8.4%-9.2% [Table]. Pneumonia was the most common (2.7-3.0%) and twice the 2005 rate. The number of centers reporting no complication data dropped to a low of 7.5% in 2011 (2008:12.6%, 2009:15.4%, 2010:13.7%, 2012:8.3%). By 2012, nearly all level Is reported complication data whereas 46.4% of level IVs reported none (I 0.5%, II 2.7%, III 8.5%, p=0.04). Data was reported the least frequently in non-teaching hospitals (15.8%, p=0.007), those in the South (19.6%, p=0.007), and those with <200 beds (23.6%, p= 0.005).

Conclusion: Overall rates of complications were nearly two-fold higher than the 2005 historic data. Reporting has dramatically improved and the NTDB may provide a valuable platform for establishing rationale and achievable benchmarks for specific complications of interest.

	2008		2009		2010		2011		2012	
	all centers	excluding non-reporters	all centers	excluding non-reporters	all centers	excluding non-reporters	all centers	excluding non-reporters	all centers	excluding non-reporters
All complications										
Exclude other	8.57%	8.79%	8.25%	8.40%	8.62%	8.70%	8.22%	8.43%	9.22%	9.22%
Including other	-	-	-	-	-	-	31.37%	32.20%	26.18%	26.18%
Pneumonia	2.95%	3.02%	2.82%	2.87%	2.73%	2.76%	2.60%	2.67%	2.83%	2.83%
ARDS	1.66%	1.70%	1.30%	1.37%	1.34%	1.35%	1.48%	1.52%	1.11%	1.11%
DVT	0.99%	1.02%	1.00%	1.02%	1.21%	1.22%	1.08%	1.11%	1.03%	1.03%
Decubitus ulcer	0.90%	0.93%	0.62%	0.63%	0.53%	0.54%	0.56%	0.57%	0.52%	0.52%
Acute Renal Failure	0.90%	0.92%	0.97%	0.99%	1.04%	1.05%	0.89%	0.92%	0.98%	0.98%
Sepsis	0.88%	0.91%	0.77%	0.78%	0.71%	0.72%	0.18%	0.19%	0.40%	0.40%
PE	0.37%	0.38%	0.32%	0.33%	0.32%	0.32%	0.32%	0.32%	0.36%	0.36%
UTI	-	-	-	-	-	-	1.48%	1.52%	2.03%	2.03%

Poster # 81

THE IMPACT OF A GERIATRIC TRAUMA SERVICE ON 30-DAY READMISSIONS AND MORTALITY AFTER DISCHARGE

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Introduction: There has been a well-documented growth in the number of geriatric trauma patients. Due to their diminished reserve and higher number of comorbidities, these patients often have longer lengths of stay and higher hospital resource utilization both in the inpatient and outpatient setting. In the past ten years, a handful of institutions have recognized the need for a multidisciplinary and standardized approach to the geriatric trauma patient, giving rise to the creation of a dedicated geriatric trauma service (GTS). After developing our own GTS, we previously found a decrease in inpatient mortality and length of stay. We hypothesized that our GTS would decrease unplanned 30-day readmissions and mortality after discharge.

Methods: With multidisciplinary input, our hospital's GTS was implemented from January to October 2013. Patients older than 55 years old with single system or minor multisystem traumatic injury were admitted to GTS. Using our trauma registry, we collected demographic data including ISS, AIS scores, in-hospital complications, readmissions, and mortality. For data analysis, patients older than 55 years with traumatic injuries and the above characteristics who were admitted to various services in the calendar year 2012 were used as our pre-implementation group, and patients admitted to our GTS from October 2013 through December 2014 were our post-implementation group. Standard statistical analysis was use to compare baseline characteristics, 30-day unplanned readmissions, and 3-month, 6- month, and 1-year mortality.

Results: A total of 1,403 patients were included in this study: 621 patients in the pre-implementation group and 782 in the post (GTS) group. The GTS patients were significantly older, with a mean age of 77.1 years compared to 74.1 years in the pre-implementation group ($p < 0.001$). Though individual AIS scores differed between groups, the ISS (mean ISS 8.99 vs 8.68 in the pre- and post-implementation groups, $p = 0.27$) and number of comorbidities were not significantly different. Eighty-eight (14.2%) of the pre-GTS group had an unplanned readmission in the first 30 days following discharge, compared to 74 (9.5%) of the GTS patients ($p = 0.0061$). Mortality was not significantly different at 3 and 6 months and at 1 year. At all time points, only age was significantly associated with mortality.

Conclusion: Following the implementation of a dedicated GTS, the proportion of patients with unplanned 30-day readmissions decreased significantly. There is no significant difference between groups in 3- and 6-month mortality or 1-year mortality.

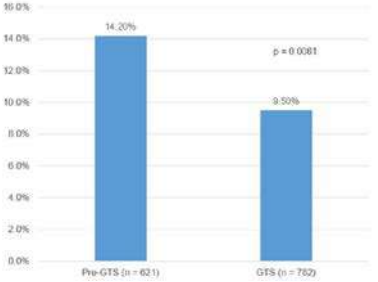
Table 1: Demographics

	Pre-GTS (n = 621)	GTS (n = 782)	p-value
Age (years)	74.11	77.14	< 0.001
ISS	8.99	8.68	0.272
AIS Head	1.10	0.79	< 0.001
AIS Face	0.12	0.13	0.6891
AIS Chest	0.16	0.35	< 0.001
AIS Abdominal	0.05	0.16	0.0757
AIS Extremities	1.48	1.62	0.0257
Length of stay (days)	5.39	4.48	< 0.001
Number of comorbidities, *n*	20.78	21.30	0.5163

Table 2: Mortality

	Pre-GTS (n = 621)	GTS (n = 782)	p-value
3-month mortality	7.25%	8.82%	0.2829
6-month mortality	12.72%	14.45%	0.3494
1-year mortality	18.36%	20.46%	0.3237

Figure 1: Unplanned 30-day readmissions



Poster # 82

ENDOTYPE-SPECIFIC MULTIPLE ORGAN DYSFUNCTION PARAMETER SEGREGATES TRAUMA PATIENTS INTO OUTCOME-BASED COHORTS CHARACTERIZED BY AN EARLY, DIFFERENTIAL INFLAMMATION BIOMARKER PROFILE

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Introduction: The design of trials aimed at early immune modification following severe injury has been limited by challenges in defining meaningful intermediate endpoints other than survival. Here, we hypothesized that an optimized Multiple Organ Dysfunction (MOD) parameter could serve as an endotype-specific endpoint to segregate patients into outcome-based cohorts, which could be characterized by dynamic changes in circulating inflammation biomarkers obtained early in the clinical course.
Methods: Using clinical and biobank data of 472 blunt trauma survivors, 376 patients admitted to the ICU and with sequential Marshall MODScores from days (D) 2-5 post-injury were studied. The cumulative MODScores from D2-D5 were then subjected to: 1) supervised decision list analysis (DLA) to determine the optimal MODScore cut-off value which could segregate the largest sample size of patients with adverse outcome; and 2) unsupervised hierarchical clustering analysis (HCA) to identify clusters among trauma patients and apply MODScore as an intermediate endpoint for interventional trials. Inflammation biomarkers (34 cytokines and chemokines) were assayed (by Luminex™) in serial blood samples (3 samples within the first 24 h and then daily up to D5 post-injury). Inflammation biomarker data were analyzed using Two-Way ANOVA ($P<0.05$).
Results: Supervised DLA suggested an optimal MODScore cut-off value of 3: MODscore >3 group (n=72) had dramatically longer ICU length of stay (LOS), days on mechanical ventilation, total LOS, and higher incidence of NI (61%) when compared to the MODScore <3 group (n=304). The unsupervised HCA segregated patients into three distinct groups: Low MODS group (n=242, average MODScore=0.5); Intermediate MODS group (n=99, average MODScore=3); and High MODS group (n=35, average MODScore=6.5). There were statistically significant differences among the three groups with regards to ICU LOS, total LOS, and days on mechanical ventilation being all greatest in the High MODS group, which in turn had a higher incidence of NI (71%) when compared to the Intermediate and Low MODS groups (46% and 19%, respectively). Circulating levels of IL-6, MCP-1, MIG, IP-10, IL-10, sST2, and IL-8 were differentially elevated upon presentation and over time in the High MODS group. These biomarkers exhibited distinct dynamic inflammatory patterns within 24 h, suggesting an early divergence of the inflammatory response which correlates with high MODS.
Conclusion: These results show that early inflammation biomarker patterns correlate with different degrees of MODS severity identified by DLA and HCA of the average MODScore D2-D5. This cumulative MODScore parameter, in turn, correlates with adverse endpoints.Our results also suggest that a subset of biomarkers measured early in the clinical course could be useful to stratify patients into cohorts at high risk for MODS.

Poster # 83

CURRENT OUTCOME OF BLUNT OPEN PELVIC FRACTURES: HOW MODERN ADVANCES IN TRAUMA CARE MAY DECREASE OVERALL MORTALITY

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Introduction: Open pelvic fracture from a blunt mechanism is a rare injury with a high mortality rate (up to 58%). There has been a paucity of literature in the past ten years investigating trends in outcomes of open pelvic fractures. In 2008, the Western Trauma Association published an evidence based algorithm for managing pelvic fractures in unstable patients. The use of massive transfusion protocols with a 1:1:1 PRBC: FFP: platelets ratio has become widespread and there is greater availability of pelvic angiography. The aim of this study is to evaluate the outcome of pelvic fractures and trends in current trauma care. We hypothesize that the development of an evidence-based algorithm, liberal use of pelvic angiography and implementation of a massive transfusion protocol (MTP) have contributed to a decrease in overall mortality for patients with blunt open pelvic fractures.

Methods: A retrospective review in an ACS-verified level I trauma center of all patients who sustained blunt open pelvic fractures from January 2010 to December 2015 was performed. The WTA algorithm with MTP (and 1:1:1 ratios) and rapid availability of angiography were uniformly used. Data collected included age, injury severity score (ISS), transfusion requirements, use of pelvic angiography, length of stay, and disposition. Patients with penetrating injuries and closed fractures were excluded. Data was compared to a similarly designed study from 2005. Dichotomous variables were compared using Chi square tests with significance attributed to a p value < 0.05.

Results: During the study period, there were 1410 patients with pelvic fractures, 71 (5%) were open. Of these, 23 were from blunt mechanisms and made up the study population. Use of angiography was higher and mortality was lower than the previous study. Thirteen patients (57%) were hemodynamically unstable, and 11 had MTP initiated.

Study (n)	Age	GCS	ISS	Patients Transfused	Pelvic embolization	LOS (survivors)	Mortality
2005 (44)	39 ± 2	12 ± 1	30 ± 2	32 (73%)	7 (16%)	22	20 (45%)
2015 (23)	43 ± 4	10 ± 1	30 ± 3	16 (70%)	10 (43%)	22 ± 5	3 (13%)
P value	-	-	-	0.62	0.014	-	0.025

Conclusions: The changes in trauma care for patients with open pelvic fracture have included the use of an evidence based algorithm, massive transfusion protocols and increased use of angio-embolization. Mortality for open pelvic fractures has decreased with these advances.

Poster # 84

AN EPIDEMIOLOGICAL OVERVIEW OF A DECADE OF GUN VIOLENCE HOSPITALIZATIONS IN A MATURE TRAUMA SYSTEM

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Introduction: Gun violence is a controversial public health issue plagued by a scarcity of recent research. We sought to provide a decade-long epidemiological overview of gun violence in Pennsylvania, analyzing temporal trends in mode, intent, and outcome. We hypothesized that decreased adjusted mortality and increased functional status at discharge (FSD) would be observed for gunshot wound (GSW) victims over the 10-year study period.

Methods: All admissions to the Pennsylvania Trauma Outcome Study (PTOS) database from 2003-2012 were queried. GSWs were defined as E-Codes 922.0-.9, 955.0-.4, 965-.4, 970, 979.4, and 985.0-.4. Collected variables included patient demographics, firearm type, intent (assault, attempted suicide), FSD (sum of feeding, locomotion, expression, transfer mobility, and social interaction discharge scores for all non-fatal patients), and mortality. Multilevel mixed-effects logistic regression models and ordinal regression analyses using generalized linear mixed models assessed the impact of admission year on adjusted mortality and FSD score, respectively.

Results: Of the 337,208 patients presenting to Pennsylvania trauma centers from 2003-2012, 15,020 (4.6%) were GSW victims. Handguns were the most common mode of injury (n=5,345; 83.9%) among cases with specified firearm type (n=6,367). The majority of GSWs were coded as assaults (n=13,079; 87.1%), with suicide attempts accounting for the second-largest subcategorization (n=1,378; 9.2%). Law enforcement inflicted GSWs accounted for 1.4% of admissions (n=203). Suicide attempts were most prevalent in older white males, while assaults were more common in young black males. Rates of GSW hospitalizations significantly decreased over the study period (test of trend p=0.001). Admission year was associated with a decreased mortality trend (AOR: 0.98, 95%CI: 0.96-1.00; p=0.110) and decreased FSD (AOR: 0.98, 95%CI: 0.96-1.00; p=0.023) while controlling for demographics and injury severity.

Conclusion: Temporal trends in outcomes suggest rates of gun violence are declining in Pennsylvania and more patients are surviving their injuries. The decrease in functional status at discharge observed likely resulted from this improved survival, as patients dying in-hospital do not receive FSD scores.

	Mortality Model (n=15,020)		Functional Status at Discharge Model (n=11,532: non-fatal patients)	
Variable	Adjusted Odds Ratio (95% CI)	p-value	Adjusted Odds Ratio (95% CI)	p-value
Admission Year	0.98 (0.96-1.00)	0.110	0.98 (0.96-1.00)	0.023
Age	1.02 (1.02-1.03)	<0.001	0.98 (0.98-0.99)	<0.001
Systolic BP	0.98 (0.97-0.98)	<0.001	1.00 (0.99-1.00)	0.274
GCS	0.73 (0.72-0.74)	<0.001	1.15 (1.13-1.17)	<0.001
ISS	1.06 (1.06-1.07)	<0.001	0.94 (0.94-0.95)	<0.001
Intent (Suicide)	1.97 (1.57-2.47)	<0.001	0.59 (0.46-0.74)	<0.001
	AUROC: 0.95			

Poster # 85

PREHOSPITAL LACTATE PREDICTS NEED FOR RESUSCITATIVE CARE IN NORMOTENSIVE TRAUMA PATIENTS

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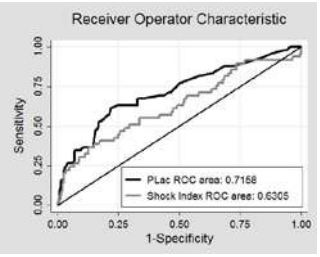
Introduction: The prehospital decision of whether to triage a patient to a trauma center can be difficult. Traditional decision-making rules are based heavily on vital sign abnormalities, which have been shown to be insensitive in predicting severe injury. Prehospital lactate (PLac) measurement could better inform the triage decision. PLac's predictive value has been demonstrated in relatively severely injured patient populations but not in the broad population of all trauma patients transported by an advanced life support (ALS) unit.

Methods: This was a retrospective cohort study of all trauma patients transported by ALS units over a 14-month period. Data were obtained from an existing Resuscitation Outcomes Consortium database and our institutional trauma registry. Hypotensive patients were excluded, as they had already been analyzed in a separate study. PLac levels taken at time of intravenous line placement were analyzed using a point-of-care device. In the primary analysis, we measured PLac's ability to predict need for resuscitative care (RC) and compared it to that of shock index (SI). Need for RC was defined as either death in the emergency department (ED), disposition to surgical intervention within 6 hours of ED arrival, or receipt of 5 units of red blood cells within 6 hours. In a secondary analysis, the risk associated with increases in PLac was calculated.

Results: Among 314 included patients, the area under the receiver operator characteristic curve (AUROC) for PLac predicting need for RC was 0.716, which was significantly higher than that for SI (0.631) (p=0.125). PLac ≥ 2.5 mmol/L had sensitivity of 74.5% and specificity of 53.4%. The odds ratio for need for RC associated with a 1-mmol/L increase in PLac was 1.29 for PLac < 2.5 mmol/L (p=0.666), 2.27 for PLac from 2.5 to 4.0 mmol/L (p=0.027), and 1.26 for PLac ≥ 4 mmol/L (p=0.011).



Conclusion: PLac measurement was strongly predictive of need for RC with adequate sensitivity in this normotensive trauma population. Prospective validation should be a focus of future investigation.

Poster # 86

RESUSCITATION HYPOCALCEMIA AND OVER-CORRECTION SHOULD BE AVOIDED IN SEVERELY INJURED PATIENTS

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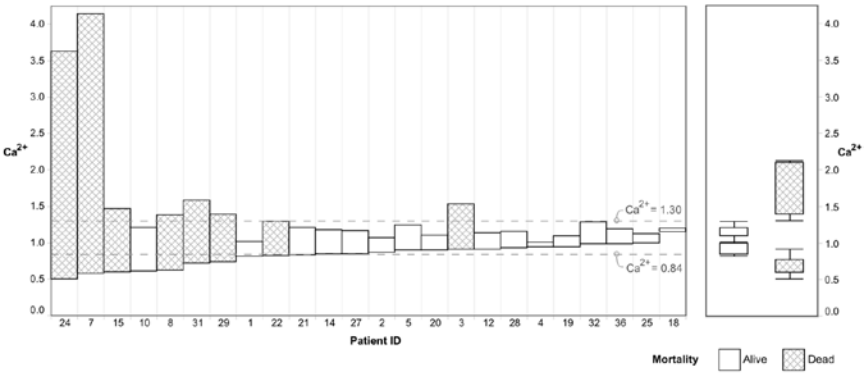
Introduction: Hypocalcemia on admission predicts both massive transfusion and mortality in severely injured patients. However, the effect of hypocalcemia that develops during resuscitation and the effect of subsequent calcium repletion remain unexplored. We hypothesize that any hypocalcemia and any over-correction of hypocalcemia in the first 24 hours after severe injury is associated with increased mortality.
Methods: All patients at our institution for whom the massive exsanguination protocol (MEP) was activated from January to December 2014 were identified. Patients transferred from another hospital, those not transfused, those with no ionized calcium (iCa2+) measured, and those who expired in the trauma bay were excluded. Hypocalcemia and over-correction were defined using the normal range of iCa 2+ at our institution, 1-1.25 mmol/L. ROC analysis (Younden's index) was also used to further examine significant thresholds for both hypocalcemia and over-correction. Hospital mortality was compared between groups. Secondary outcomes included need for ACLS, volume of blood products, and amount of calcium given.
Results: MEP was activated for 38 patients of whom 14 were excluded leaving 24 for analysis. Hypocalcemia occurred in 23 (96%) patients, and of these 9 (39%) were over-corrected. Mortality was no different in hypocalcemia vs no hypocalcemia (35% vs 0%, p=0.47) but was greater in over-correction vs no over-correction (89% vs 0%, p<0.001). ROC analysis indicated inflection points in survival outside of an iCa2+ range of 0.84-1.30 mmol/L (Figure). Using these values, 9 (39%) had severe hypocalcemia with a 78% mortality (vs 7%, p<0.001), and 7 (30%) had extreme over-correction with a 100% mortality (vs 6%, p<0.001). Severely hypocalcemic and extreme over-corrected patients also received more red blood cells, plasma, platelets and calcium repletion.
Conclusion: Hypocalcemia and calcium over-correction occur commonly during the initial resuscitation of severely injured patients with lethal injuries. Mild hypocalcemia may be tolerable, but more severe hypocalcemia and over-correction should be avoided. Further analysis to determine the optimal approach to calcium management during resuscitation is warranted.



Poster # 87

RESUSCITATIVE ENDOVASCULAR OCCLUSION OF THE AORTA (REBOA) CAN BE ALTERNATIVE TO AORTIC CROSS CLAMP IN ADULT TRAUMA PATIENTS REQUIRING TORSO SURGERY –A PROPENSITY SCORE MATCHING ANALYSIS

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Introduction: Retrospective studies based on a propensity-score-matching analysis previously warned that use of resuscitative endovascular occlusion of the aorta (REBOA) against non-compressive torso hemorrhage might be dangerous in comparison of those without REBOA (Norii et al. J Trauma Acute Care Surg. 2015, Inoue et al. J Trauma Acute Care Surg. 2016). However, questions remain; Whether the subjects needed REBOA were basically comparable to those without REBOA or not, or, furthermore, whether REBOA could be alternative to aortic cross clamp (ACC) procedure or not. The study purpose was to compare mortality of surgically treated torso trauma subjects who underwent REBOA, ACC or neither of them.

Methods: This study was designed as a multicentered retrospective cohort study based on a non-binary propensity-score-matching analysis across 3 groups. Adult (≥16 y) trauma patients who underwent any torso surgery were selected from the Japan Trauma Databank through the year of 2004 to 2014 after the multiple imputation (25 datasets) for missing values in all the study variables. Patients were excluded if they had systolic blood pressure at presentation of 0 mmHg, heart rate at presentation of 0 /minute, or the unsurvivable injury under the definition of the abbreviated injury scale, or underwent both REBOA and ACC. A propensity score was computed of mechanism of trauma, pretreatment physiological status and AIS. A propensity score matching extracted baseline-characteristics-adjusted subjects who underwent REBOA, ACC or neither of them. The study outcome was defined as hospital mortality and was assessed between the groups.

Results: Out of a total of 11969 subjects eligible to the study selection criteria, 572, 229 and 11168 subjects underwent REBOA, ACC or neither of them (control). A propensity score matching extracted each of 174 subjects for REBOA, ACC and the control group, respectively, and those mortality during hospitalization were 66%, 87% and 43%, respectively. Aortic occlusion with REBOA or ACC was associated to excess hospital mortality in comparison of the control (OR 1.40, 95%CI [1.29, 1.51], P<0.001). Use of REBOA was associated to lower hospital mortality in comparison of that of ACC (OR 0.81, 95%CI [0.75, 0.89], P<0.001).

Conclusion: Aortic occlusion with REBOA or ACC before torso surgery in comparison of non-occlusion was associated to excess in-hospital mortality. It is concerned that subjects who requires aortic occlusion may be heterogeneous to those do not undergo these procedures. If so, this study advocated that REBOA might be superior to ACC in terms of hospital mortality and warranted future efficacy trials to test REBOA versus ACC in surgically treated torso trauma patients.

Poster # 88

PERITONEAL RESUSCITATION MITIGATES CRYSTALLOID RESUSCITATION INJURY AND ENHANCES THE VISCERAL PROTECTIVE EFFECTS OF PLASMA RESUSCITATION FOLLOWING HEMORRHAGIC SHOCK

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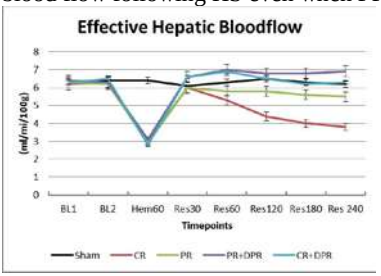
Introduction: The use of plasma-based resuscitation (PR) following hemorrhagic shock (HS) has been associated with a decrease in mortality. Prior investigations have demonstrated that the use of PR can reduce systemic inflammation. We hypothesize that utilizing PR following hemorrhagic shock will enhance visceral blood flow (VBF) and reduce intestinal injury and inflammation.

Methods: Utilizing a validated model of HS, rats were randomized to compare crystalloid resuscitation (CR) of shed blood plus 2 volumes of LR, plasma based resuscitation (PR)of shed blood plus one volume of frozen plasma, and both CR and PR resuscitation augmented via peritoneal resuscitation (DPR). Galactose clearance was used to evaluate VBF. Pathology graded H&E, immunohistochemistry staining, and m30/m65 caspase cleave fragment analysis evaluated intestinal injury. Serum intestinal fatty acid binding protein (iFABP), LPS, and cytokines were used to evaluate systemic inflammation. All data are presented as mean ± SEM. Results were analyzed by 1-way analysis of variance with Tukey post hoc tests.

Results: Plasma resuscitation (PR) enhanced VBF over CR alone; however the administration of DPR enhanced VBF in both resuscitation models.(Figure 1) PR animals had reduced necrosis ([m65 fragment –m30 fragments] U/L:185±18 vs. 236±25, $p<0.03$) compared to CR but PR animals treated with DPR had reduced necrosis compared to PR alone (DPR:157±18 vs 185±18; $p<0.043$). CR alone treated animals had a worse ilieal injury (histology grade) compared to either PR animals or DPR treated animals. Serum TNFa, iFABP, and Il-6 at 4 hours post resuscitation were reduced in the PR animals vs CR animals alone, while LPS levels were not significantly different. Both CR and PR animals treated with DPR had reduced TNFa, iFABP, LPS and IL6 levels compared to PR alone.

Conclusion: PR enhanced visceral blood flow and reduced ileal injury following HS compared to CR alone. DPR appears to mitigate the injury associated with crystalloid resuscitation and enhance visceral blood flow and reduce systemic inflammation even further in the PR treated groups indicating that further research into augmenting visceral blood flow following HS even when PR is utilized is warranted.



Poster # 89

MULTI-INSTITUTIONAL ANALYIS OF NEUTROPHIL TO LYMPHOCYTE RATIO IN PATIENTS REQUIRING MASSIVE TRANSFUSION PROTOCOL; A NEW MORTALITY PREDICTOR VALUE

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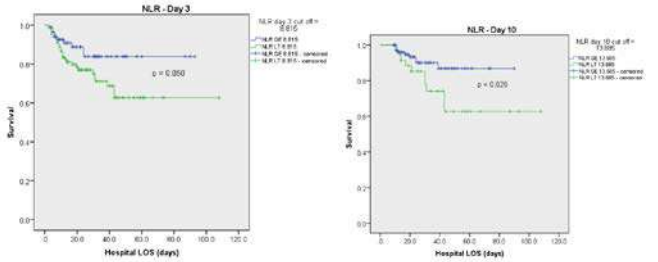
Introduction: In a recent single institution analysis the neutrophil/lymphocyte ratio (NLR), a marker of inflammation was associated with increased mortality in critically ill patients. The purpose of this study was to determine the relationship between NLR and outcomes in patients requiring the initiation of a Massive Transfusion Protocol (MTP). We hypothesized that the NLR would be a prognostic indicator of mortality in MTP patients.

Methods: This was a multi-institutional retrospective cohort study of adult trauma patients (≥18 years of age) who received MTP between November 2014 - November 2015 was performed. Differentiated blood cell counts obtained at day 0, 3 and 10 were used to obtain NLR. Receiver operating characteristic (ROC) curve analysis was used to assess the predictive capacity of NLR on mortality. To identify the effect of the NLR on survival, Kaplan-Meier survival analysis and Multivariable Cox proportional hazard model was used.

Results: A total of 285 MTPs were analyzed from 9 participating institutions. Patient demographics were {median(IQR)}: Age 35(25-47), ISS 25(16-36), GCS 9(3-15), blunt trauma 57.2%, male 80%. Using the ROC curve analyses at ICU days 3 and 10, optimal NLR cut-off values of 8.81 and 13.68 were calculated by maximizing the Youden index. KM curves at day 3 (p=0.05) and day 10 (p=0.02) revealed a NLR greater than or equal to these cut-off values as a marker for increased in-hospital mortality. (Blue line is value below cut point; green line is value above cut point)



Cox regression models failed to demonstrate a NLR over 8.81 as predictive of in-hospital mortality at day 3 (p= 0.056) but predictive for mortality if over 13.68 at day 10 (p=0.03).

Conclusion: This is the first multi-institutional analysis that correlates NLR, a marker of inflammation as an early mortality predictor in MTP patients. Further research should focus on factors that can help ameliorate NLR's in this patient population is needed.

Poster # 90

A Geriatric Trauma Service: are there perks?

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Introduction: Management of the elderly trauma patient poses several challenges including chronic conditions that may confound conventional treatment. The geriatric trauma patient is known to have poorer clinical outcomes when compared to their younger counterpart irrespective of injury severity score (ISS). In recognition of the above, trauma centers across the nation have begun to develop specialized Geriatric Trauma Services to manage this population. In 2009, our trauma center developed a G60 (≥ 60 years) Trauma Service. The G60 trauma service consists of a multi-disciplinary team (internal medicine, surgical sub-specialist, physical therapy etc.) lead by the trauma surgeon. Here we present our 5 year experience with the G60 Trauma Service.

Methods: The Trauma Registry was queried for all patients ≥ 60 years managed between January 1 st, 2006 and December 31st, 2014 after IRB approval. The G60 program was implemented on August 1st, 2009. Patients were divided to pre-august 2009 as non-G60 (**nG60,** n=694) and post-august 2009 as G60 (**G60,** n=2,011) program. Patient demographics (age, sex), injury parameters (cause of injury, ISS), clinical outcomes (ICU length of stay – ILOS, hospital length of stay – HLOS, discharge disposition and mortality), and trauma patients transferred to our hospital were recorded. Impact of variant ISS between **nG60** and **G60** was corrected by dividing HLOS and ILOS by ISS prior to statistical analysis to produce rHLOS and rILOS.

Results: Patient demographics show an average age of 75 ± 10 y/o with 59% female and 40% male for the two groups. The cause of injury was 77% fall, 18% motor vehicle crash (MVC) and 5% other. No statistically significant variation is noted in demographics. Multi-disciplinary management has allowed for a significant (p-value: 0.0006) reduction in rILOS from in the **nG60** and **G60**. Unfortunately, no statistically significant (p-value: 0.018) reduction in rHLOS was noted between **nG60** and **G60** group. However, **nG60** patients have poorer clinical outcomes with 3.4x more likely to be discharge to long term acute care facilities. Contrarily, **G60** patients were 2x-1.4x more likely to be discharge to assistance facilities (including nursing homes and rehabilitation facilities). Mortality was significantly (p-value: 0.0001) higher in the **nG60** (8%) relative to **G60** (5%) group. Finally, a statistically significant (p-value: <0.01) increased in trauma patients transferred to our hospital seen after the implementation of the **G60** (23%) program relative to **nG60** (12%).

Conclusion: Long term benefits of the G60 program are based on the multidisciplinary management of patients. A reduction in rILOS, improved discharge disposition and decreased mortality were noted irrespective of ISS for the **G60** group. Additionally, an influx in patients is noted with the implementation of the G60 program. The Committee on Trauma should consider incorporating the G60 trauma service as an essential requirement for the designation of a Level II or I trauma center.

Poster # 91

ARE NARCOTIC PRESCRIPTIONS ACTUALLY FILLED FOR INJURED CHILDREN? FINDINGS GLEANED FROM A STATEWIDE PRESCRIPTION MONITORING PROGRAM.

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Introduction: Injured children frequently receive narcotic prescriptions at the time of hospital discharge, yet the proportion of patients who fill those prescriptions is not known. Our state recently mandated a statewide electronic prescription monitoring program (PMP) which offers an opportunity to better understand narcotic usage after trauma.

Methods: Admitted trauma patients < 18 y.o. discharged home from an academic level 1 pediatric trauma center in 2014 were identified. Discharge pain medication prescriptions were abstracted from medical record and PMP queried for same patients. US Census Bureau data for median household family income (MHFI) by ZIP code tabulation area was identified for each patient. The associations between demographics, Injury Severity Score (ISS), and MHFI, and narcotic prescribing or filling was analyzed.

Results: Of 256 injured children discharged home, 63% received a narcotic prescription. Of those prescribed a narcotic, 63.4% filled the prescription.

	Prescribed, % (p)	Filled, % (p)
Male v. Female	64 v. 62 (NS)	65 v. 59 (NS)
White v. Non-white	64 v. 60 (NS)	66 v. 58 (NS)
Hispanic v. Non-Hispanic	56 v. 65 (NS)	47 v. 67 (.04)
ISS <4 v. ISS >4	59 v. 67 (.21)	54 v. 73 (<.01)
Surgery v. None	90 v. 43 (<.0001)	78 v. 40 (<.0001)
Age in years <1, 1-2, 3-5, 6-12, >12	22, 54, 66, 74, 71 (<.0001)	50, 48, 48, 64, 78 (.03)
MHFI in quartiles 1, 2, 3 4	63, 51, 55, 52 (NS)	48, 67, 70, 44 (NS)

Logistic regression showed increased adjusted odds ratios for prescription filling for age ≥6 y.o. (1.4, 95%CI 1.029-1.991), ISS > 4 (2.2, 1.02-4.554), or surgical procedures (5.3, 2.496-11.185), but not for gender, race, ethnicity, or MHFI.

Conclusion: A significant proportion of narcotic prescriptions given to injured children at hospital discharge go unfilled, especially for the very young. Those with minor injuries (ISS <4) received narcotics prescriptions at the same rate as those with more severe injuries. It is unclear if nonfulfillment represents over-prescribing by practitioners or under-utilization by parents. We did not find a strong correlation between population-based socioeconomic factors (MHFI) and either prescribing or filling narcotics. In light of the national epidemic of prescription narcotic misuse, the causes of the discrepancy between narcotic prescribing and filling warrants prospective review, as does the correlation between prescription filling and narcotic use.

Poster # 92

CHILDREN WITH SEVERE TRAUMATIC INJURIES FARE BETTER WHEN MANAGED AT PEDIATRIC TRAUMA CENTERS

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Introduction: With advancements in traumatology, pediatric trauma emerged as a different entity. Recently there has been a push towards development of dedicated pediatric trauma centers and preferential triage of pediatric trauma patients to these centers. The aim of this study was to assess the difference in outcomes of pediatric and adult trauma centers in the management of severely injured pediatric trauma patients and assess factors contributing to these differences.

Methods: We performed a two-year (2011-2012) analysis of National Trauma Databank. We included all pediatric patients (age <18 years) who were severely injured (ISS>15). Patients with no vital signs at presentation, transferred to another hospital, and missing data on primary outcomes were excluded from the analysis. Patients were stratified into two groups: presenting at a pediatric trauma center versus presenting at an adult trauma center. Primary outcome was emergency department (ED) and in-hospital mortality. Missing data was accounted for by using missing value analysis and multiple imputation technique. Binary logistic regression was performed.

Results: A total of 14,906 patients were included in the analysis. Mean age (SD) was 12.5 (5.4), median ISS (IQR) was 22 (17-27), 67% were male, and 46% were treated at a pediatric trauma center. Overall in–hospital mortality (8.2% vs. 10.3%, $p<0.001$) and ED mortality (1.9% vs. 4%, $p<0.001$) was significantly lower in children managed at a pediatric trauma center. In children with penetrating trauma ED mortality was lower in pediatric trauma centers (6.3% vs. 12%, $p<0.001$), however there was no difference in overall mortality (20% vs. 21%, $p=0.6$). On regression analysis, after controlling for age, gender, ISS, hemodynamic instability at the scene or during transport, and transit time from injury to ED, Pediatric trauma centers were associated with 20% reduction in overall (OR [95% CI]: 0.8[0.7-0.9], $p=0.003$) and 45% reduction in ED mortality (OR [95% CI]: 0.55[0.4-0.7], $p<0.001$).

Conclusion: Pediatric trauma centers provide a dedicated team of trauma professionals with extended resources for children presenting with trauma. The results of our study suggest that even after controlling for transit time, hemodynamic instability at the scene pediatric trauma centers confer a significant reduction in mortality.

Poster # 93

When is a Rib Fracture Not Just a Rib Fracture? Implications of Rib Fractures in Pediatric Trauma Patients

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Introduction: Due to their highly elastic nature, rib fractures in children are thought to be an indicator of significant injury and are believed to be associated with high rates of mortality and injuries to other body regions. Previous studies that have examined this issue were limited by small sample sizes. The goal of our study was to determine the association between rib fractures and mortality, abdominal injuries, and head injuries in children, and to compare these rates to those found within the adult population.

Methods: The National Trauma Data Bank was queried from 2008-2013 to compare patients with and without rib fractures. Subjects were categorized into four age groups: 0-10, >10-21, >21-60, and >60 years. Multivariate logistic regressions were used to test for association between rib fractures and outcomes after adjusting for demographics, mechanism, intent, and comorbidities.

Results: 212,459 patients were identified with rib fractures including 1,923 children <10 years and 15,641 children ages >10-21 years. Children <10 years with rib fractures had a mortality of 7.6%, and were found to have an increased risk of mortality, abdominal solid organ injury, head injury, and need for abdominal procedure compared to children without rib fractures (Table 1).

Table 1: Outcomes for children ≤10 years with rib fractures compared to children ≤10 years without rib fractures

Outcomes	Estimate	95% CI	P-Value
Mortality	3.88	(3.22, 4.69)	<.0001
Abdominal solid organ injury	7.54	(6.80, 8.37)	<.0001
Head injury	1.18	(1.08, 1.31)	0.0005
Number body regions AIS>2	1.53	(1.48, 1.59)	<.0001
Abdominal procedure	7.59	(4.94, 11.65)	<.0001

CI – confidence interval; AIS – abbreviated injury score

In children, there was no difference in mortality for multiple rib fractures compared to a single rib fracture (odds ratio = 1.44, 95% Confidence Interval = 0.93,2.25). Of note, compared to adults with rib fractures, children <10 years with rib fractures had higher rates of mortality, abdominal solid organ injury, and head injury (Table 2).

Table 2: Outcomes for children ≤10 years compared to adults >21-60 years with rib fractures

Outcomes	Estimate	95% CI	P-Value
Mortality	1.56	(1.29, 1.89)	<.0001
Abdominal solid organ injury	2.37	(2.14, 2.62)	<.0001
Head injury	1.35	(1.22, 1.49)	<.0001

CI – confidence interval

Conclusion: Rib fractures in children are associated with higher rates of mortality and injuries in other body regions compared to children without rib fractures and adults with rib fractures. These findings support that the presence of even a single rib fracture in a child should prompt further work-up for these associated injuries.

Poster # 94

Rethinking Transfusion Threshold to Maintain Brain Tissue Oxygenation in a Young Animal Model

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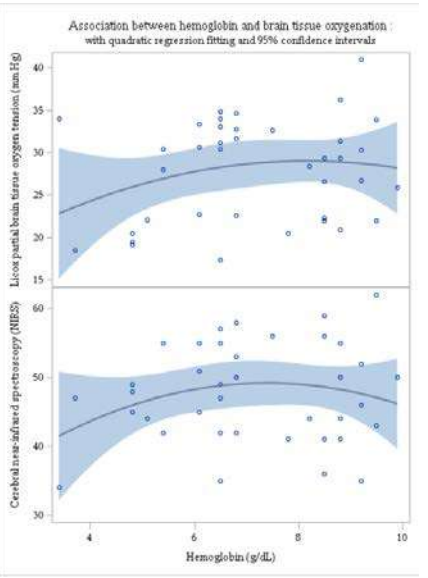
Introduction: Mixed evidence exists regarding the benefit of red blood cell (RBC) transfusion in patients who sustain traumatic brain injuries (TBI). While some studies support RBC transfusion as a strategy to increase brain tissue oxygenation, other studies have demonstrated negative short and long-term effects following transfusion. The data is even more limited in children. We designed a pilot study to investigate the effects of anemia and RBC transfusion on brain tissue oxygenation in a young animal model.
Methods: Brain tissue oxygenation was measured in 7-week old pigs (N=4) using Licox brain tissue oxygen probes and cerebral near infrared spectroscopy (NIRS) monitors. Subjects underwent interval bleeding followed by volume replacement with plasma and/or crystalloid solution to maintain euvolemia. Hemoglobin levels were measured to correlate with brain tissue oxygenation. Vital signs and other lab values were also recorded. Subjects were transfused with RBCs after severe anemia developed. Multivariate linear regression models were used to test for association between brain tissue oxygenation and vital signs, pCO2, bicarbonate, pH, base deficit, and lactic acid.
Results: No significant relationship was found between hemoglobin and brain tissue oxygenation. There appeared to be a positive association seen when hemoglobin dropped below 7.5 g/dl (Figure). Above this value, there was no correlation between hemoglobin and brain tissue oxygenation. Brain tissue oxygenation was extremely sensitive to oxygen saturation. Deliberate induction of hypoxia demonstrated a decrease in partial brain tissue oxygen tension to 6.7 (high mortality risk) within several minutes. A multivariate linear regression model demonstrated that oxygen saturation ($p<0.001$) and lactic acid levels ($p<0.001$) were associated with brain tissue oxygenation, while hemoglobin ($p=0.076$) was not found to be significantly associated with brain tissue oxygenation after adjusting for vital signs and lab values ($R^2 = 0.596$).



Conclusion: Brain tissue oxygenation in a young animal model appears to be affected by anemia when hemoglobin falls below 7.5 g/dl suggesting that RBC transfusion above this level is unnecessary to maintain brain tissue oxygenation. Avoiding hypoxia appears to be more important in maintaining brain tissue oxygenation. Larger studies are needed to confirm these results. Further studies using this animal model can help formulate RBC transfusion guidelines in pediatric TBI patients.

Poster # 95

DISPARITIES IN ACCESS TO SPECIALTY CARE FOR CHILDREN WITH SEVERE BURNS

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Introduction: Pediatric burns require 120,000 emergency department visits and 10,000 hospitalizations annually. Burn centers specialize in burn treatment, from the initial assessment, resuscitation, and wound coverage, to rehabilitation; improving long-term quality-of-life in severely burned patients. The American Burn Association (ABA) has guidelines regarding which burns should receive treatment at a burn center; however there is geographic variation in the distribution of burn centers. Therefore, many children meeting ABA criteria are treated at non-burn hospitals. We hypothesized that disparity in access would be primarily related to resource availability and would not be affected by other factors.

Methods: Using weighted discharge data from the National Inpatient Sample 2001-2011, we identified pediatric patients with International Classification of Diseases-9th Revision (ICD-9) discharge codes for burn injury (940.0-949.5). ICD-9 codes, comorbidity data, and mechanism of injury codes were used to identify patients meeting ABA burn center treatment criteria. Burn centers were identified using the 2011 American Hospital Association Database. Data was restricted to states with a burn center. Using an Adjusted Wald test, age, gender, race/ethnicity, payer status, injury characteristics, hospital location, length of stay, number of procedures, and discharge disposition were compared for 49,133 pediatric patients meeting ABA criteria.

Results: Of patients meeting ABA criteria, 80.1% (n=39370) were treated at a burn center and 19.9% (n=9763) were treated at a non-burn hospital. Patients treated at a burn center were younger (5.6 vs. 6.8 years old; $p = 0.001$) and met a greater number of criteria than their counterparts at non-burn centers (1.51 vs. 1.37; $p < 0.001$). Sex and race did not vary between the two groups. Burn center patients compared to non-burn center patients were more likely to have Medicaid as their primary payer (52.2% vs. 47.4%; $p = 0.020$) and less likely to have private insurance (37.6% vs. 43.1%; $p = 0.027$). Burn center patients were more likely to have burns to the head, neck, and face (41.5% vs. 33.7%; $p < 0.001$) and burn injuries on multiple body regions (60.8% vs. 38.3%; $p < 0.001$). While treatment center did not vary by region (Northeast, South, Midwest, West), only 0.1% of burn center patients were treated at a rural hospital compared to 11.2% of non-burn center patients ($p < 0.001$). Both length of stay and number of procedures were significantly higher for patients treated at burn centers (7.0 vs. 4.7 days, $p < 0.001$ and 2.1 vs. 1.2 procedures, $p < 0.001$; respectively). There were no significant differences in discharge disposition between the two groups.

Conclusion: Our results suggest that 20% of the children for whom the ABA recommends burn center treatment do not receive recommended care. Over 10% of patients treated in non-burn hospitals were treated in rural hospitals, suggesting that distance to a burn center may be one reason why severely burned children are not transferred. Contrary to our predictions, our data suggests that in addition to geographic resource limitations, there may be some disparity in access to specialized burn care due to primary payer. Our findings of an increased proportion of patients with public vs. private insurance at burn centers compared to non-burn centers are similar to studies of trauma center utilization. While it appears that insurance status may impact the decision to transfer to a burn center for some children, this will require further study.

Poster # 96

ADOLESCENT MOTOR VEHICLE CRASH PREVENTION THROUGH A TRAUMA CENTER SPONSORED INTERVENTION PROGRAM.

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Introduction: While programs exist to educate teen drivers as to the perils of drunk and distracted driving, actual data supporting effective injury rate reduction of such is limited. We assessed the effectiveness of a hospital sponsored interactive risky behavior reduction program. This intervention was instituted for a four year period at a large area high school served by a single emergency response system and Level 1 Trauma Center.

Methods: Using our institutional trauma registry, we identified motor vehicle crash drivers with ages 16-21 and living in zip codes served only by the intervention high school and Trauma Center. The incidence of crashes involving these drivers was compared over two intervals, consisting of pre-intervention and post-intervention surveillance, each over a period of three years. Additionally, crashes involving the same age group from a demographically similar adjoining county served by a large high school that did not have the intervention were compared. Statistical comparisons were performed by Chi Square Analysis. The potential economic impact of any change of crash incidence was extrapolated using published data from the Web-based Injury Statistics Query and Reporting System (CDC WISQARSTM).

Results: During pre-intervention surveillance, the number of adolescent motor vehicle crashes from the isolated catchment area was 166. The number in the post-intervention period was 105. This represents a significant risk reduction of 37% ($P<0.05$). The crash incidence in the non-intervention control catchment area remained statistically unchanged during the same period. The study populations remained stable in both areas during surveillance. Extrapolating the economic impact of such a decrease in crash occurrences with published figures from CDC WISQARS TM date, the return on investment of our intervention was 16,600%, representing a decreased burden of cost of more than 3.3 million dollars.

Conclusion: Our results suggest that educational intervention programs strategically directed towards adolescent drivers have a significant impact on the incidence of motor vehicle crashes in such populations. The decrease in occurrences leads to a significant decrease in morbidity and mortality, as well as a reduction of healthcare economic burden.

Poster # 97

CASUALTY CARE IN THE CLASSROOM- HEMORRHAGE CONTROL FOR SCHOOL STAFF

Christopher Wistrom DO, Mike Blaser Thomas Brunner James MacNeal DO, Karen Schulte Greg Jones Special Agent FBI, Scott Meyers Chief Deputy Sheriff, Alissa DeVos MPAS, Todd Daniello MD, Sean Marquis MD,MPH, Rick Barney MD, Robb Whinney DO, John Pakiela DO, Rodney VanBeek MD, Krista Kimball MPAS Mercy Hospital And Trauma Center

Introduction: Significant resources are dedicated to "active shooter" response training for police, school officials, and EMS personnel; however, emergency medical personnel cannot treat the wounded until the scene is secured, which often takes significant time. Following a FBI school shooting tabletop scenario, a core group of physicians, law enforcement, EMS, fire, and school officials developed the Casualty Care in the Classroom course, a cost effective reproducible train the trainer program to increase readiness and competence of school staff to care for those immediately wounded. This study examines the immediate and long term effects of the Casualty Care in the Classroom course on its participants.

Methods: Standardized survey administered pre, immediately post and one year following training. All questions are asked on a 1-5 likert scale. Those surveyed include elementary, middle, and high school teachers and staff.

Results:

Percent of respondents that answered 'Agree' or 'Strongly Agree'

	prior to training (N=1594)	immediate post-training (N=493)	1 year post-training (N=297)
Do you know law enforcements role in a rapid response situation?	45.36%	93.32%	85.23%
Are you capable of helping and injured person?	77.32%	92.91%	92.41%
Do you know how to apply a tourniquet?	35.65%	93.93%	91.14%
Would you apply a tourniquet if you knew how?	82.64%	94.53%	93.67%
Do you know the procedure for dealing with a crisis in the building?	55.89%	81.38%	79.32%
Do you feel you are prepared for a crisis situation?	43.55%	80.57%	62.45%
Do you feel the school district is prepared for a crisis situation?	46.93%	77.94%	62.03%

Conclusion: The Casualty Care in the Classroom course successfully placed lifesaving skills and tools in the hands of school officials thereby building sustained confidence in personal and organizational response to a crisis situation.

Poster # 98

PREVENTING CONCUSSIONS WITH CORE MUSCLE TRAINING: A STUDY IN HIGH SCHOOL ATHLETES

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Introduction: Over the last 10 years sports related concussions have been a topic of extensive debate. While much of the emphasis of research has focused on timely diagnosis and treatment, there has been little reported on concussion prevention. The goal of this study is to examine the use of core training as a preventative tool for concussions in the high school athlete. We hypothesize that with increased core strength, an athlete will have more control of their body mechanics and the movement of their head and neck during a fall or collision, allowing them to reduce the whiplash mechanism that is often the cause of a concussion.

Methods: We performed a non-randomized prospective study involving high school athletes participating in football, soccer, and volleyball. During the fall of 2014, student athletes in grades 9-12 at a local high school participated in a ten-week training session with exercises in the following areas: mobility, agility, stability, strength and flexibility (MASSf). Exercises in each area were performed for a total of twenty minutes daily during the pre-season training sessions. Logs of all concussions diagnosed using ImPACT concussion testing were kept during the fall sports season. Statistical analysis was done using Chi-square to calculate expected/observed frequency and Chi-squared test statistic, x 2. Test significance was accepted at a $p<0.01$. The MASSf program was repeated in the 2015 season validating our primary results.

Results: 119 athletes participated in the 2014 pre-season MASSf training sessions and were subsequently monitored for concussions during the corresponding sports season. Utilizing 2010-2013 concussion data, or pre-MASSf data, the calculated expected number of concussions for 2014 was 10.87 (Table 1). With the addition of the MASSf program the observed incidence of concussions was reduced to 2. Using a chi-squared contingency test, our calculated test statistic, x 2=9.84, corresponds to a p-value of 0.0017 (Table 2). The MASSf program was repeated in the 2015 season with almost identical results, 2 concussions in 121 participants.

Conclusion: Our study showed a statistically significant decrease in concussion rates among high school athletes after participating in pre-season MASSf training. These results were then reproduced in the subsequent year. This supports the theory that strengthening core muscles correlates with a decreased risk of concussion. The MAASf program shows promise as a primary prevention method to reduce sports related concussions.

TABLE 1	Injured	Uninjured	Total
Expected			
Pre-MASSf	46.13	458.87	505.00
MASSf	10.87	108.13	119.00
	57	567	624
Observed			
Pre-MASSf	55	450	505
MASSf	2	117	119
	57	567	624

TABLE 2	Injured	Uninjured	Test Statistic
Pre-MASSf	1.17	0.17	1.88
MASSf	7.24	0.73	7.97
			9.84

Poster # 99

HISPANIC CHILDREN ARE LESS LIKELY TO RECEIVE REHABILITATION THAN NON-HISPANIC WHITE AND BLACK CHILDREN FOLLOWING TRAUMATIC INJURY.

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Introduction: Trauma remains a leading cause of pediatric morbidity and mortality in the US, accounting for over 150,000 deaths annually. Children who survive major injury often require some form of rehabilitation prior to regaining long-term functionality after hospitalization. While racial disparities are described in discharge destination following adult trauma, this has yet to be evaluated in the pediatric trauma population. We hypothesize that Hispanic and Black children are less likely to receive intensive rehabilitation as compared to non-Hispanic Whites.

Methods: Pediatric traumas (age ≲ 17 years) were evaluated using National Trauma Data Bank data from 2007-2012. Discharge destination was defined ordinally based on increasing intensity of rehabilitative services. Propensity-Score Weighting was used to balance observed pre-hospital covariates between race categories. Ordinal logistic regression was used to adjust for in-hospital characteristics and evaluate racial disparities within discharge destination.

Results: 461,238 pediatric traumas were analyzed, of which 330,430 incidents were included in the propensity-weighted analysis. Distribution by race was as follows: 221,130 (67%) were classified as non-Hispanic White, 50,605 (15%) Hispanic and 58,695 (18%) Black. Propensity weighting resulted in covariate balance. After ordinal logistic regression, Black patients were slightly more likely to be discharged to a higher level of rehabilitation than non-Hispanic Whites (adjusted OR=1.17 CI=1.11-1.23). However, Hispanic (adjusted OR=0.71 CI=0.66-0.76) patients were less likely to be discharged to a higher level of rehabilitation as compared with non-Hispanic Whites.

Conclusion: Hispanic pediatric trauma patients are significantly less likely to receive intensive rehabilitation than their non-Hispanic White counterparts and may represent a vulnerable population. In contrast, Black pediatric trauma patients are equally if not more likely to receive intensive rehabilitation as their non-Hispanic White counterparts. Differences in discharge disposition may be influenced by social, cultural, and economic factors as well as real, or perceived expectations on the part of clinicians and families. Unmeasured patient, physician and institutional factors contributing to this inequity must be identified in order to provide all injured children with the resources needed to achieve the best possible outcome following trauma.

Poster # 100

A STATEWIDE OVERVIEW OF PEDIATRIC SEVERE TRAUMATIC BRAIN INJURY 2003-2013: INCREASING CRANIECTOMY RATE WITH NO CHANGE IN OUTCOMES

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Introduction: Pediatric severe traumatic brain injury (sTBI) remains an area in need of further research. We sought to provide a statewide epidemiological overview of pediatric neurosurgical practice patterns and outcomes over an 11-year period in a mature trauma system. We hypothesized that increased rates of craniectomy, increased functional status at discharge (FSD), and decreased mortality would be observed.

Methods: All pediatric (<18 years old) isolated sTBI patients were extracted from the Pennsylvania Trauma Outcomes Study dataset from 2003-2013. Isolated sTBI was defined as a head Abbreviated Injury Scale (AIS) score ≥3 with a Glasgow Coma Scale (GCS) score ≤8 and all other AIS body region injury scores <3. Dead on arrival, transfer out, and penetrating trauma patients were excluded. Multilevel mixed effects logistic regression models assessed the adjusted impact of admission year on craniotomy, craniectomy, intracranial pressure monitor (ICP), and mortality rates while controlling for age, admission systolic blood pressure, GCS, Injury Severity Score (ISS), head AIS, and pediatric managing facility. A generalized linear mixed model analyzed the temporal trend in FSD (summed feeding, locomotion, expression, transfer mobility, and social interaction scores) for the non-fatal patient population while controlling for the same covariates.

Results: A total of 1,414 isolated sTBI pediatric patients presented over the study period. Intervention rates were 13% for craniotomy, 6% for craniectomy, and 18% for ICP. Overall mortality rate was 10% and the mean FSD score was 16.7±5.0. Admission year was associated with a 22% increase in craniectomy rate (AOR: 1.22, 95%CI 1.13-1.36; p<0.001) and a 6% increase in ICP (AOR: 1.06, 95%CI 1.01-1.11; p=0.016). No association was found between admission year and craniotomy rate (AOR: 0.98, 95%CI 0.93-1.04; p=0.516), mortality (AOR: 1.02, 95%CI 0.96-1.09; p=0.512), or FSD (AOR: 0.93, 95%CI 0.85-1.03; p=0.166).

Conclusion: While shifts in neurosurgical practice patterns were found over the 11-year study period, no improvements in outcomes were observed. Pediatric neurosurgeons must prioritize research identifying optimal management approaches to improve outcomes in the sTBI population.

	Mortality Model (n=1,414)		Functional Status at Discharge Model (n=1,270: non-fatal patients)	
Variable	Adjusted Odds Ratio (95% CI)	p-value	Adjusted Odds Ratio (95% CI)	p-value
Admission Year	1.02 (0.96-1.09)	0.512	0.93 (0.85-1.03)	0.166
Age	0.94 (0.90-0.98)	0.005	1.05 (0.98-1.13)	0.180
Systolic BP	0.98 (0.97-0.99)	<0.001	0.99 (0.98-1.01)	0.477
GCS	0.64 (0.56-0.74)	<0.001	1.23 (1.12-1.36)	<0.001
ISS	1.08 (1.05-1.12)	<0.001	0.75 (0.71-0.79)	<0.001
Head AIS	1.18 (1.00-1.40)	0.052	1.04 (0.78-1.38)	0.803
Pediatric Center	0.50 (0.26-0.98)	0.042	0.95 (0.34-2.72)	0.928
	AUROC: 0.85			

Poster # 101

RISK FACTORS FOR ACUTE RESPIRATORY DISTRESS SYNDROME FOLLOWING HEMORRHAGE: FINDINGS FROM THE PROPPR STUDY

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Introduction: The Pragmatic Randomized Optimal Platelet and Plasma Ratios (PROPPR) study evaluated the effects of plasma and platelets on hemostasis and mortality during damage control resuscitation. The pulmonary consequences of resuscitation strategies that mimic whole blood remain unknown. We hypothesized that volumes of crystalloid and blood would be risk factors for ARDS following severe trauma with major bleeding.

Methods: Severely injured patients predicted to receive a massive transfusion were randomized to 1:1:1 vs. 1:1:2 plasma-platelet-RBC ratios at 12 level I North American trauma centers. Patients with survival >24 hours, an ICU stay, and a recorded PaO2/FiO2 (P/F) ratio were included for analysis. ARDS was defined as a P/F ratio <200 mmHg with bilateral pulmonary infiltrates on chest imaging and determined by case review by each site principal investigator. Data are expressed as medians and odds ratios (OR) [95% confidence interval]. Statistical significance is $p<0.05$.

Results: Of the 680 patients randomized, 454 patients were included in this subset analysis (230 received 1:1:1, 224 1:1:2). Age, sex, mechanism of injury, head, chest, abdomen and extremity abbreviated injury scale (AIS) scores did not differ between the groups. Volume of plasma and platelets given at 0-6 and 0-24 hours significantly differed, while RBCs and crystalloid did not. The lowest P/F ratio (173 vs. 156 mmHg) and highest PEEP (7 vs. 8 cm H2O) during the first 7 days and highest tidal volume during the first 2 days (7.9 vs. 7.9 mL/kg of predicted body weight) did not differ. No differences in ARDS rates (14.8 vs. 18.4%), ventilator-free (24 vs. 24) or ICU-free days (17.5 vs. 18), hospital length of stay (22 vs. 18 days), or 30-day mortality were found (28 vs. 28%). ARDS was associated with blunt mechanism of injury (OR 3.61 [1.53-8.81] $p<0.01$) and chest AIS score (OR 1.40 [1.15-1.71] $p<0.01$). Each 500 mL of crystalloid infused during hours 0-6 was associated with a 9% increase in the rate of ARDS (OR 1.09 [1.04-1.14] $p<0.01$, [Figure]). Blood products given at 0-6 or 7-24 hours were not risk factors for ARDS.

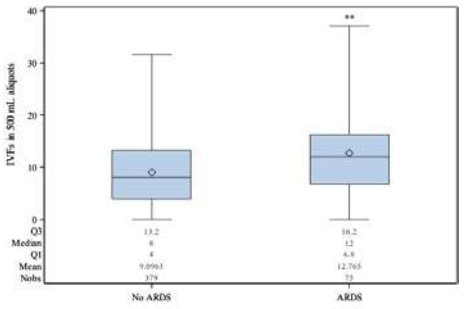

Figure: Crystalloid provided at 0-6 hours (**p<0.0001).

Conclusion: Acute crystalloid exposure, but not blood products, emerges as a modifiable risk factor for the prevention of ARDS following hemorrhage. Damage control resuscitation with plasma and platelet ratios that mimic whole blood does not appear to contribute to pulmonary morbidity.

Poster # 102

CONTRAST-ENHANCED ULTRASOUND: A NOVEL METHOD FOR BLOOD VOLUME ASSESSMENT IN HEMORRHAGIC SHOCK

Chad B. Walton Ph.D., Susan Steinemann* MD, Michael Wong DVM, Krupa Gandhi MPH, Jack Branston BS, Subodh Mishra BS, Mihae Yu* MD, University of Hawaii

Introduction: Accurate estimation of circulating blood volume (CBV) is essential in patient management, but standard methods for measuring CBV are impractical in many critical situations. CEUS is a technique that makes use of contrast agents to enhance the echogenicity of blood, thereby improving the visualization and quantitation of blood volume (Miele V et al., Br J Radiol. 2016 Jan 8:20150823). We hypothesized that 3D contrast-enhanced ultrasound (CEUS) of intraabdominal sites could reliably estimate CBV in a rodent model of acute hemorrhagic shock.

Methods: Microbubbles were injected via tail vein catheter into 13 mice. 4 sites (diaphragmatic-hepatic, spleno-renal, cysto-colic, hepato-renal) were imaged using a contrast destruction/replenishment protocol, where contrast agent is acoustically destroyed in the field of view and the resultant acoustic signal is quantified as the tissue is replenished with contrast. After baseline imaging, 20% of the calculated CBV was withdrawn via right common carotid catheter. Following a 20 minute recovery period, microbubbles were re-injected and the 4 abdominal sites reimaged. After 20 minutes, mice were then resuscitated with saline to baseline CBV. Microbubbles were injected a third time, and the 4 sites reimaged post-resuscitation. Correlations between CBV and area under the replenishment curve (AUC) were analyzed using partial correlation coefficients controlling for ultrasound site.

Results: The calculated CBV positively correlated with the AUC at baseline, blood loss and post-resuscitation when controlled for ultrasound site. (Table)

Conclusion: 3D CEUS is feasible using abdominal windows similar to FAST. CBV can be accurately measured during acute blood loss and resuscitation.

Variables	Partial Correlation	p-value
Calculated Circulating Blood Volume (CCBV) and AUC Baseline Measurement	0.8330	<.0001
Total Blood Volume Loss (TBVL) (%) and AUC Blood Loss Measurement	-0.3524	0.0130
Calculated Circulating Blood Volume (CCBV) and AUC Blood Loss Measurement	0.6947	<.0001
Calculated Circulating Blood Volume (CCBV) and AUC Resuscitated Measurement	0.8040	<.0001

Poster # 103

MONOCYTE TISSUE FACTOR EXPRESSION CAUSES MICROCLOT IN DISTANT UNINJURED ORGANS AFTER TRAUMATIC SHOCK IN A MURINE MODEL

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Introduction: Tissue factor (CD142), a pro-coagulant protein of the extrinsic pathway, is mobilized during trauma primarily by upregulation of expression in monocytes. The consequences of this mobilization are unknown. We hypothesize that tissue factor mobilization in the setting of tissue injury and hemorrhage contributes to microvascular thrombosis in distant uninjured organs.

Methods: We developed a murine model of hemorrhage and pulmonary contusion to simulate trauma with hemorrhagic shock. To create a pulmonary contusion injury, anesthetized male C57/Bl6 mice were injured with a 50g mass dropped from 0.35m. Class II hemorrhage was induced by retro-orbital phlebotomy, removing 15% of the animal's blood volume. Animals were divided into 4 groups: sham (n=3), hemorrhage (n=2), contusion (n=3), and combined hemorrhage with contusion (n=4). Animals were sacrificed 6 hours after injury. Renal tissue was prepared for hematoxylin-eosin (H&E) staining and immunohistochemistry (IHC) for fibrin. Peripheral blood leukocytes were analyzed by flow cytometry for expression of CD142.

Results: Tissue factor mobilization by monocyte expression occurred with hemorrhage or injury. Flow cytometry (n=2 each group) demonstrated increased expression of CD142 by monocytes (mean±SEM) in the hemorrhage only (76.8%±13.5%), contusion only (89.4%±0.3%), and combined groups (76.7%±2.7%). Sham animals expressed CD142 on 47.5%±1.3% of monocytes. H&E staining of kidney sections demonstrated microvascular thrombosis in 2 of 4 animals that underwent combined hemorrhage with contusion, but not in any animals in the sham, hemorrhage only, or contusion only groups. This finding was corroborated by IHC staining for fibrin.

Conclusions: This murine model of trauma demonstrates early tissue factor mobilization after direct injury by pulmonary contusion, class II hemorrhage, and combined injury with hemorrhage. Additionally, some animals which underwent injury and hemorrhage developed renal microvascular thrombosis within 6 hours of injury. We propose that increased levels of circulating tissue factor together with the altered hemodynamics and inflammatory milieu of hemorrhagic shock contribute to microvascular clot deposition. Further studies are needed to establish a causal relationship between tissue factor mobilization and microvascular clot deposition, but this represents a potential mechanism for early end-organ injury in the setting of severe trauma.

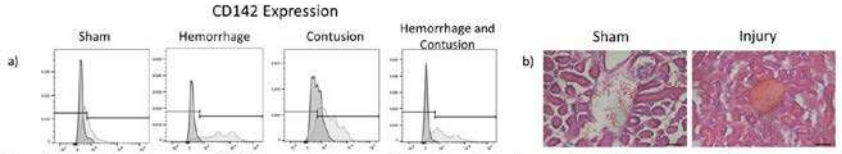

Figure 1: (a)Flow cytometry analysis of CD142 expression by monocytes in uninjured animals versus those with hemorrhage, contusion or a combined injury, expressed as fluorescence intensity by unit distribution. The dark population is an isotype control and the light population is the CD142 antibody. Both hemorrhage and contusion increase expression of CD142. Monocytes were gated by light scatter characteristics. (b) H&E staining of kidney sections after sham and combined hemorrhage with contusion. Renovascular thrombosis is present only in the combined hemorrhage with contusion model.

Poster # 104

INDICES OF INFLAMMATION AND OXIDATIVE STRESS FOLLOWING RESUSCITATIVE ENDOVASCULAR BALLOON OCCLUSION OF THE AORTA (REBOA) IN A SWINE HEMMORHAGE MODEL

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Introduction: Recent years have seen renewed interest in an endovascular approach to stem uncontrolled bleeding from the torso. Despite reported success of REBOA in both experimental animals and humans, concern has been raised about REBOA-induced lower body ischemia and an inflammatory response. The present study investigated indices of inflammation and oxidative stress in tissues above and below the balloon in hemorrhaged swine treated with REBOA under different protocols.

Methods: Sedated, spontaneously breathing adult male minipigs were hemorrhage 65% of estimated blood volume over 1 hr. They were then randomized to 4 groups (n=7/gp): 1) positive control (PC)- immediate return of shed blood, 2) R30- REBOA for 30 min, then return of shed blood and 3) R60 and 4) R60(30)- REBOA for 60 min but shed blood returned at 60 min or 30 min into the 60 min REBOA period. REBOA was performed using the ER-REBOA catheter (Prytime Medical Devices Inc, Boerne, TX). Pigs were monitored for 4 hr after hemorrhage, euthanized and lung, heart, liver, jejunum and kidney were collected and assayed for cytokines and indices of oxidative stress.

Results: The 65% hemorrhage model was 78% lethal with an average survival time of 81 min, whereas all REBOA animals survived the 4 hr experimental period. Tissues above the balloon (lung and heart) and below the balloon (liver, kidney, jejunum) were assayed at the end of the 4 hr experiment. No significant elevations in heart or lung cytokines were observed in any REBOA group compared with PC except a slight elevation in lung R60 TNF-α compared with PC. In contrast, significant elevations (2 to 9 fold) in liver and kidney R60 IL-6, liver R60 IL-1β and jejunal R60 TNF-α were observed compared with PC. In addition there were no significant differences in heart or lung total antioxidants, reduced glutathione (GSH), nitric oxide (NO) or NAD/NADH ratio among the REBOA groups compared with PC. In liver and kidney, 50% reductions in R60 GSH concentrations were observed compared with PC. Liver R60 NO was elevated and total antioxidants and glutathione reductase activity was about 20% lower than in PC. Kidney R60 Mn superoxide dismutase activity was 55% higher than PC. Generally, there were no significant differences in R60(30) indices measured, compared with R60 in any tissue.

Conclusion: The results of this study indicate that the heart and lung were not affected by up to 60 min REBOA. In contrast a significant inflammatory response and oxidant stress were detected in ischemic tissues after 60 min balloon occlusion compared with tissues from the PC group. Although not significant results suggested that return of shed blood at 30 min ameliorated these responses somewhat. Studies are underway to reduce lower body ischemia associated with REBOA.

Funded in part by US Army Medical Research Materiel Command

Poster # 105

TRANSFUSIONS INCREASE THE RISK OF EVERY NSQIP POST-OP OCCURRENCE: ANALYSIS FROM A STATE COLLABORATIVE

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Introduction: The value of red blood cell blood transfusion (BT) by a risk benefit analysis has not been fully elucidated. Balancing questionably increased oxygen carrying capacity to organ system, immunosuppressive and infectious complications is necessary. Because these unfavorable effects are often attributed to other processes, the association to BT is often insidious or ignored, even with prospective data. Despite restrictive practice guidelines, BT remains frequent, especially in surgical patients. We studied the effect of BT on a large surgical population to determine their effects on outcomes.

Methods: Using our Statewide collaborative NSQIP database, we looked at general and vascular cases over one year and calculated the relative risk of NSQIP post-operative occurrences (POC) for cases with BT compared to those without. The marginal effect of BT on the probability of postoperative occurrences was also evaluated to determine possible causal impact. The collaborative captures about 50% of cases done in the state by over 750 surgeons and the member hospitals range from rural facilities to university sites.

Results: From October 2014 to September 2015, 23,229 cases were entered into the database, 1443 had BT. BT patients had a statistically significant increase in relative risk (RR) with all 18 POC, (range 1.92 for superficial surgical site infection to 13.75 for renal failure). Table 1 highlights the POC with the largest RR. Deriving probabilities of a POC, BT, directly contributed significantly in mortality, need for CPR (CPR), Ventilation
>48 hours (V>48), pneumonia, sepsis and septic shock and unplanned intubation (UI).

Table 1. (UCL= upper control limit, LCL=Lower control limit)

POC	Renal fail	V>48	Septic Shock	CPR	Death	UI	Renal injury
RR	13.75	12.20	11.71	10.60	8.57	8.48	6.13
UCL	21.30	15.58	16.34	14.95	10.50	10.87	9.32
LCL	8.84	9.53	8.35	7.48	6.97	6.58	3.95
Cases	41	119	64	58	148	99	32

Conclusion: Red blood cell transfusion is associated with an increased RR for all NSQIP POCs and has a direct causal relationship with seven. These factors should be considered in the risk-benefit discussion and decision when ordering transfusions in surgical patients.

Poster # 106

PULSE PRESSURE AS AN EARLY WARNING OF HEMORRHAGE IN TRAUMA PATIENTS

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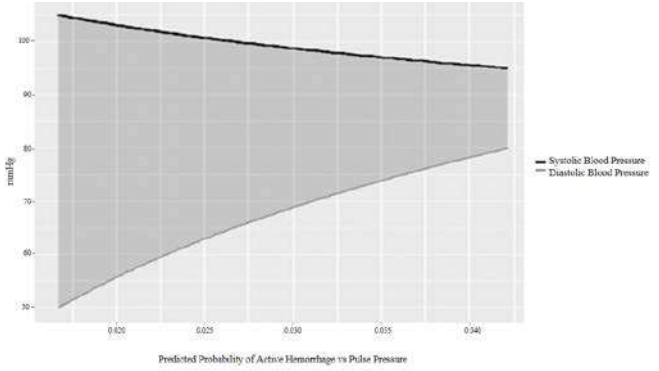
Introduction: Hypotension based on low systolic blood pressure (SBP) is a well documented indicator of ongoing blood loss. However, the utility of pulse pressure (PP) for the detection of hemorrhage has not been well-studied. The purpose of this study was to determine whether a narrowed PP in normotensive patients is an independent predictor of Critical Administration Threshold (CAT+) hemorrhage requiring surgical or endovascular control.

Methods: Retrospective single-center study (01/2010-10/2014), including trauma patients ≥16 yo with SBP≥90 mmHg upon emergency department (ED) admission. We identified patients that were both CAT+ (3 units pRBC/60 minutes within 24 hours of admission) and required interventional radiology (IR) or surgery for definitive hemorrhagic control. These patients were labeled Active Hemorrhage (AH). Univariate analyses compared demographic data, clinical interventions and in-hospital outcomes between the AH and non-AH patients. Stepwise logistical regression identified independent predictors for AH.

Results: Out of 18,015 trauma patients with normal SBP, 283 (1.6%) met the criteria for clinically significant hemorrhage. Patients were predominantly male (74.4%) with mean age 43.1±19.5, median Injury Severity Score (ISS) 5 (IQR:2-10) and median Glasgow Coma Scale (GCS) 15 (IQR:15-15). Mean PP was significantly lower in the AH compared to non-AH group (39±18 vs 53±19, p<0.0001). Multivariate analysis revealed that narrowed initial ED PP is an independent predictor of AH (AOR 0.975) along with increased age (AOR 1.01), penetrating mechanism (AOR 9.476), lower field SBP (AOR 0.985), increased ED heart rate (AOR 1.024), and increased ISS (AOR 1.136). Adjusted PP means were 61±10 in patients over age 60 years vs 51±11 in younger patients after adjusting for covariates of sex, age, race and weight, p<0.0001. Regression analysis identified a significantly higher risk of AH at a PP cutoff ≥ 55mmHg (AOR 3.44, p=0.005, AUC 0.955) in patients≥ 61 yo and 40mmHg (AOR 2.73, p<0.0001, AUC 0.940) for patients 16-60 yo. Predicted probability of AH increases as PP narrows (see Figure).



Conclusion: In patients who are normotensive in the resuscitation bay, narrowed PP is an independent predictor of active hemorrhage requiring blood product transfusion and intervention for hemorrhage control.

Poster # 107

EARLY ABG IMPROVES VENTILATOR MANAGEMENT IN PATIENTS WITH HEMMORHAGIC SHOCK

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Introduction: Hemorrhage is the leading cause of early postinjury death. Control of bleeding is hindered by postinjury coagulopathy, which arises from the synergistic effects of acidosis, hypothermia, and coagulopathy ("bloody vicious cycle"). In addition to restoration of intravascular volume, prompt respiratory support to prevent hypoventilation is considered essential. On the other hand, recent prehospital studies suggest positive pressure ventilation has detrimental effects in shock states. Whether purposeful hyperventilation to offset metabolic acidosis in an effort to restore blood pH to physiologic values leads to improved outcomes is not known. We hypothesized that early recognition of acid-base disturbances leads to earlier implementation of optimal minute ventilation, which would then lead to earlier correction of acidemia and improved lactate clearance.

Methods: Patients requiring emergent (<1 hour from arrival) non-neurosurgical operative intervention were identified at a regional, academic level I trauma center. A set of patients requiring a massive transfusion protocol (MTP) was also examined. Patients with an ER-drawn arterial blood gas (Early ABG) were compared to those in whom ABG was not done until after arrival in the OR (Late). Endpoints included time to optimal (>10 L/min) ventilation, correction of acidemia, and lactate clearance. All statistical comparisons were made using student t-test.

Results: 148 patients over an 18-month period met entry criteria. Overall mortality was 29.0%, with an average injury severity score (ISS) and initial pH of 26 ± 7.2 and 7.21 ± 0.02, respectively. Among acidemic patients (pH<7.25), there was a significant intraoperative delay in instituting a high V E strategy in the late ABG group (62.3±10.4 min) compared to those with an early ABG (29.3 ± 8.12 min, $P < 0.05$). Only 16.7% of patients with an ER-drawn ABG were started on high V E settings compared to 4.3% of patients with a late ABG. In contrast, there was no apparent delay in instituting a high VE strategy in MTP with late ABGs. That being said, only 20.8% of patients in this subset were started on high V E settings. Hypercarbia was present on the initial ABGs of 56.8% of MTP patients overall and 72.2% of acidemic MTP patients. Among MTP patients with an ER-drawn ABG and an initial arterial pH above 7.2, we found that 81.8% had worsening of their acidosis on follow-up intraoperative ABG, all of which were at least partially due to worsening hypercarbia. There was a non-significant trend towards improved lactate (mmol/L) clearance (decrease by 2.83 ± 1.3 vs. 1.4 ± 1.2, $P = 0.2$) and shorter time (min) to correct pH to above 7.25 (90.3 ± 15.1 vs. 128 ± 31.5, $P = 0.15$) in MTP-patients managed intraoperatively by high V E strategy.

Conclusions: Relative hypercarbia was a frequent finding in patients with hemorrhagic shock. Injured patients requiring emergent operative intervention were given high V E faster when an early ABG was performed. Massively hemorrhaging and acidemic patients received similar ventilator management regardless of the ABG timing, and an ER-drawn ABG that shows pH>7.2 may lead to inappropriately low initial V E settings. Though a trend towards improved lactate clearance and correction of acidemia exists for high VE strategy, further investigation is needed.

Poster # 108

SPECTRAL ANALYSIS OF HEART RATE VARIABILITY IN A SWINE HEMORRHAGE MODEL REVEALS MARKERS OF MORTALITY

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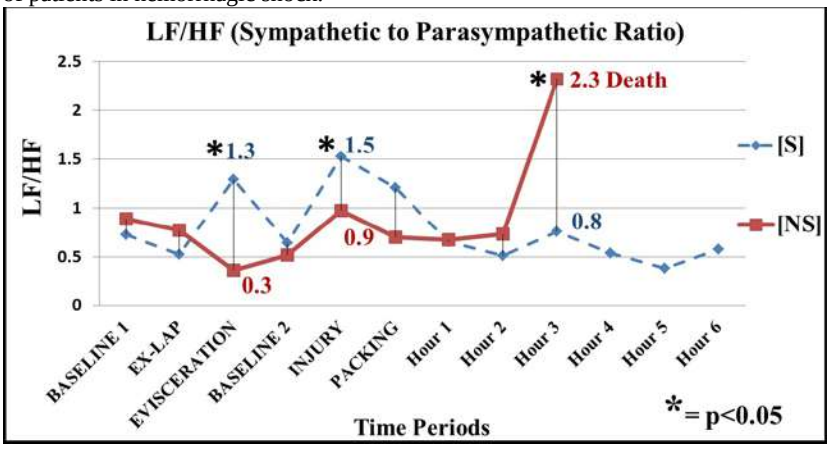
Introduction: Spectral analysis of continuous blood pressure and heart rate provides a quantitative assessment of autonomic response to hemorrhage. This may reveal markers of mortality as well as endpoints of resuscitation.

Methods: 14 pigs sustained a standardized retrohepatic IVC injury, progressed to class III hemorrhagic shock, then received abdominal packing followed by 6 hours of crystalloid resuscitation. Fourier transformation calculations were used to convert the components of BP waveform variability into its corresponding frequency classification. The relative sympathetic to parasympathetic tone was expressed as LF/HF ratio.

Spectral Frequency Classifications		
Very Low Frequency	VLF	Renin-Angiotensin Aldosterone
Low Frequency	LF	Sympathetic Tone
High Frequency	HF	Parasympathetic Tone

Results: Baseline hemodynamic parameters were equal for the Survival [S](n=11) vs Non-Survival [NS](n=3) groups. LF/HF ratio decreased during initial laparotomy and bowel manipulation in the non-survival group ([S]1.3 vs [NS]0.3 $p<0.05$). LF/HF ratio increased significantly before death compared to the corresponding time in the survival group ([S]2.3 vs [NS]0.8 $p<0.05$). The non-survival group had significantly lower VLF signal during the hemorrhage and resuscitation period ([S]29.8±2.5 vs [NS]5.6±3.9 $p<0.05$).

Conclusion: A decreased LF/HF ratio, indicative of parasympathetic predominance, prior to resuscitation is an independent risk factor for hemodynamic instability. However, an increased LF/HF ratio, indicative of sympathetic predominance, during resuscitation is a marker of impending death. Furthermore, a decreased VLF signal during resuscitation indicates an additional marker of impending death. These data indicate that quantitative assessment of autonomic response can be a predictor of mortality and guide resuscitation of patients in hemorrhagic shock.



Poster # 109

TRAUMATIC INJURIES CAUSE AN INCREASE OF THROMBOCYTIC AND ENDOTHELIAL MICROPARTICLES – ANALYSIS OF POSSIBLE BIOMARKER CORRELATED TO TRAUMA SEVERITY

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Introduction:
Microparticles (MP) are subcellular vesicles with a size of 0.1 - 0.9 µm, which are released after stimulation or apoptosis from different cell types such as thrombocytes and endothelial cells. Recent evidence suggests that MPs have a pivotal role at the conjunction of the cellular and plasmatic coagulation systems. The trauma-related failure of the coagulation system, the acute traumatic coagulopathy (ATC), and uncontrolled hemorrhage still account for approximately 50% of deaths within the first 48 hours after trauma. To understand the role of MPs after trauma, we analyzed the MPs' quantity and cellular origin compared to healthy individuals.

Methods:
Severely injured patients meeting the following criteria were included: Injury Severity Score ≥16, age ≥18 years, <2000ml preclinical iv-fluids and <120 minutes between injury and hospital admission. Healthy individuals (n=10) were used as control. Persons treated with coagulation-influencing medications were excluded in both groups. In trauma patients, blood was drawn at hospital admission and after 24 and 72 hours. Flow cytometry (BD Accuri C6) using cell specific markers were used to determine the MPs' quantity and their cellular origin of. Assessing the MPs' influence on the coagulation system, MPs were correlated with clinical data and thromboelastometry.

Results:
In 2015, 23 trauma patients were recruited with amean age of 59.6 ± 16 years and a mean ISS of 30.5 ± 13.5. Compared to healthy individuals, the number of thrombocytic CD42b+ MP were 8.7-fold higher (mean±SD: trauma 2481 ± 3338/µl vs healthy 285 ± 59/µl; $p<0.001$). Activated procoagulatoric MP were 21-fold higher (trauma 504 ± 883/µl vs. healthy 24 ± 30/µl; $p<0.001$). Endothelial CD144 + MP increased similarly (trauma 1246 ± 1138/µl vs. healthy 159 ± 95/µl; $p=0.001$). The number of thrombocytic MP correlated with white cell count ($p=0.02$) while the number of activated endothelial MP correlated negatively with coagulation parameters such as INR ($p=0.018$) and EXTEM-MCF ($p=0.04$).

Conclusion:
In conclusion, the number of circulating thrombocytic and endothelial MPs increased after trauma and was associated with injury severity. Assuming a procoagulatoric potential, these particles might counteract the development of ATC. Further studies will be required to determine the functional characterization of procagulatoric MP.

Poster # 110

Therapeutic trigger value of fibrinogen in patients with severe trauma

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Introduction: Low fibrinogen (Fb) level in patients with traumatic hemorrhage is key component of coagulopathy and associated with worse outcomes. Recent massive transfusion protocol has contributed to maintain the higher levels of fibrinogen, but the evidence for its trigger value is still weak. In this study, we aimed to clarify therapeutic trigger value of Fb in patients with severe trauma.

Methods: A single-institution prospective observational study was conducted from January 2012 to August 2015. Of 2,612 trauma patients admitted to a Japanese civilian trauma center, 1085 adult patients who were ISS >9 and transported from the scene as subjects in this study. Fb values were measured at the time of admission in all patients. Correlation was assessed with the Pearson method. Receiver operating characteristic (ROC) curve analysis was performed to evaluate the admission Fb level with respect to discriminating emergency transfusion (ET: transfusion with in 24 hours after admission) and mortality. Multivariable logistic regression was used to evaluate admission Fb level as an independent predictor of mortality. P values <0.01 were considered significant.

Results: Victims of blunt trauma accounted for 96.1%. Pre-hospital treatment was performed for 65.8% of the patients. Median age of the patients was 59 [IQR:42-70] years, median injury severity score (ISS) was 20 [13-33], and mortality rate was 12.6%. The proportions of patients with admission Fb levels below 1.0, 1.01 to 1.50, 1.51 to 2.0, more than 2.01 (g/L) were 9.1%, 16.6%, 27.7%, and 46.5%, respectively. Admission Fb value was associated with the injury severity (ISS; Correlation coefficient:-0.36, P<0.01, revised trauma score;0.45,P<0.01, respectively). The area under the curve of the ROC curve of Fb value for ET and mortality were 0.73 (95% confidence interval[CI]:0.70-0.76, P<0.01) and 0.88 (0.84 – 0.92, P <0.01). Multivariable analysis adjusted for age, ISS, RTS and pre-hospital treatment revealed that low Fb level below 1.50 g/L was predictor of mortality (Odds ratio:6.54, 95%CI:2.93-14.59, P<0.01).

Conclusion: Hypofibrinogenemia below the 1.50 g/L was a prognostic factor. This number would be acceptable to the therapeutic trigger value.

Poster # 111

CHANGES IN INSURANCE COVERAGE AND OUTCOMES AMONG YOUNG ADULT TRAUMA PATIENTS AFTER IMPLEMENTATION OF THE ACA

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Introduction: As the leading cause of death and disability among young adults (19-34y), trauma represents a considerable concern, particularly for uninsured paitents. The Patient Protection and Affordable Care Act (ACA) was designed to address this issue by increasing coverage in order to promote enhanced access to care. The full extent of its effects on clinical outcomes and insurance coverage remain unclear. We investigated the impact of the ACA, including the 2010 Dependent Coverage Provision (parents' plans until 26y) and 2013 Marketplace Open Enrollment and Medicaid Expansion.
Methods: Data from the 2009-2015 Maryland Health Services Cost Review Commission, which contains complete hospitalization records from all payers within the state, were queried for young adult trauma patients. Differences in insurance and outcomes were compared before/after DCP implementation (2009 vs. 2011) and enrollment/expansion (2011-2012 vs. 2014-2015) using difference-in-difference (DID) models to compare initially-eligible (<26y) vs. ineligible (≥26y) patients. Stepwise before/after changes were further considered among young adults as a whole and based on variations in stratified demographic sub-groups. Joinpoint (time-trend) regressions assessed overall changes in trends from 2009-2015.
Results: A total of 32,322 trauma admissions were included. DCP rollout corresponded to a significant 4.7% absolute increase in private insurance among eligible patients, despite declining rates of privately-insured among patients aged ≥26y (-4.1%; DID 8.8% p<0.001). Corresponding drops in uninsured (DID -3.5% p=0.034) were driven by changes in White (-6.2%), male (-4.9%) patients and did not alter trauma outcomes. Rollout of the full ACA, in contrast, demonstrated significantly greater gains (DID p<0.001) among older patients that were significant for both initially-eligible and ineligible patients: overall Medicaid +21.1%, uninsured -18.7%, private -3.3%. Differences were most pronounced among underserved populations and coincided with a +5.2% gain in discharge to rehabilitation, +1.42 day increase in LOS, and -0.44 day required ICU stay (p<0.001). In-hospital morbidity and mortality did not change.
Conclusion: In contrast to marginal gains associated with implementation of the DCP, which tended to affect privileged patients and did not alter trauma outcomes, introduction of Medicaid Expansion in 2013 (FY 2014) was associated with an 18.7% drop in uninsured and significant changes in clinical outcomes. Among young adult patients, these changes were driven by a 21.1% increase in Medicaid coverage that coincided with a significant decline in the proportion of patients who were privately insured.

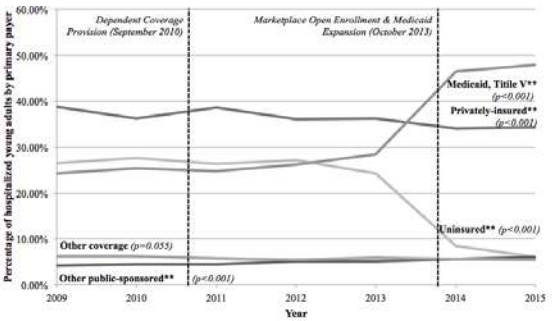

Figure: Changes in insurance coverage, 2009-2015, and joinpoint regression results

Poster # 112

MANAGEMENT OF RIB FRACTURES: NATIONAL TRAUMA DATABASE EVAULATION OF RIB FIXATION

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Introduction: Rib fractures are commonly associated with blunt chest wall trauma and are seen in up to 40% of this patient population. The cornerstone of management of chest wall trauma includes multi-modal pain control for adequate respiratory mechanics. Current recommendation is for consideration of rib fixation in patient with flail chest as studies have shown improved outcomes for this diagnosis. However, there have been increased indications for surgical fixation in the recent years with no large study confirming improved outcomes. This NTDB study will evaluate indications, timing, and outcomes of patients undergoing rib fixation during a two year period.

Methods: This was a retrospective review of the National Trauma Database over a two year period, 2011-2012. All patients admitted with rib fractures were reviewed. Overall outcomes of patients who received rib fixation were compared to patients managed without fixation. Propensity score matching was then performed and outcomes compared between the two groups.

Results: During the two year study period, 183,456 patients with rib fractures were identified. The rib fixation group included 12,528 patients and 170,928 patients had no rib fixation. Overall, patients who underwent rib fixation were younger (47 versus 53 years old, $p< .0001$), more severely injured (average ISS 22 versus 14, $p< .0001$), and had a higher mean chest AIS score compared to the no fixation group. Patients within the rib fixation group were also more likely to have pulmonary contusions, hemothorax, pneumothorax, flail chest, require tube thoracostomy, and had higher number of rib fractures. Flail chest was seen in 11% of the rib fixation group compared to 4% of the no fixation group, $p< .0001$. Only 1% of patients within each group received epidural or para-vertebral analgesia. Overall outcomes found that patients undergoing rib fixation had increased length of stay (12 versus 5 days, $p< .0001$), ventilator days (7 versus 4 days, $p<.0001$), pneumonia (12.2% versus 5%, $p< .0001$), but a decrease in mortality (2.2% versus 5.2%, $p< .0001$). Average time to rib fixation was 1 day. On propensity score matching similar outcomes were found.

Conclusions: Over a two year period, 7% of patients with rib fractures underwent rib fixation. Several meta-analyses have found improved outcomes in patients undergoing rib fixation for flail chest. However, our data confirms that indications for rib fixation is much broader as only 11% of patients undergoing fixation had flail chest. The current study found that patients undergoing fixation were more severely injured, but still had a significant survival benefit.

Poster # 113

ACCESS TO HEALTH INSURANCE IS NOT SUFFICIENT TO IMPROVE NON-ECONOMIC OUTCOMES AFTER INJURY

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Introduction: Retrospective studies indicate that lack of health insurance is associated with increased morbidity and mortality after injury, particularly for patients in the lowest socioeconomic levels. Further, injured patients in the lowest socioeconomic strata are thought to have higher healthcare utilization and higher out of pocket costs than those in higher socioeconomic strata. Access to health insurance for injured patients in the lowest socioeconomic strata may improve these outcomes. In 2008, a limited expansion of the Medicaid program in Oregon occurred for low–income adults. The expansion was accomplished by random lottery, creating a randomized controlled trial of insurance coverage among those in the lowest socioeconomic levels. The purpose of this study was to determine the effect of insurance coverage on mortality, quality of life, healthcare utilization and out of pocket costs among injured patients.

Methods: The Oregon Health Insurance Experiment Public Use Files were utilized for this study. Adults (≥18) who were eligible for Medicaid and who suffered an injury after randomization were included in this post-hoc analysis of the randomized trial. Those selected for Medicaid were compared to those without coverage. Outcomes of interest were mortality, quality of life (Short-Form 8), healthcare utilization, and personal healthcare expenditures.

Results: 2,527 patients met inclusion criteria, and 986 were randomized to Medicaid. There were no differences in age, gender or race between those Selected and Not Selected for Medicaid. For those injured any after randomization, there were no differences in emergency department visits, hospitalizations, quality of life, or mortality at 1 year. However, those without Medicaid were more likely to have out of pocket health care expenditures and to have to borrow money to pay for health care related debts than those selected for Medicaid (Table, *p<0.05 vs Selected).

	Selected n = 986	Not Selected n = 1541
ED Visits (mean±se)	3.2±0.1	3.3±0.08
Hospitlizations (mean±se)	0.38±0.4	0.35±0.04
Quality of Life – SF-8		
Physical Component Score (mean±se)	42.8±0.5	42.3±0.5
Mental Component Score (mean±se)	41.8±0.6	42.1±0.5
1 year mortality	1.4%	1.6%
Any out of pocket expenditures	55%	63%*
Had to borrow money to pay for healthcare	23%	30%*

Conclusion: In this randomized natural experiment, obtaining health insurance did not result in reductions in mortality, improvements in quality of life nor reduced healthcare utilization for injured patients. However, having insurance protected injured patients in the lowest socioeconomic strata from financial consequences of their injury. Simply improving insurance access does not appear to change injury related morbidity and mortality in a state with a developed, inclusive trauma system. Except for personal economic outcomes, access to high quality trauma care in an inclusive, developed trauma system may equalize outcomes for those in low socioeconomic strata more than just access to insurance coverage. Policies that encourage equal access to trauma care may result in similar health related outcomes after injury. On the other hand polices that provide health insurance for injured in the lowest socioeconomic strata may limit the personal financial consequences for these vulnerable, injured patients.

Poster # 114

Heath-related quality of life in trauma patients at 12 months after injury: a prospective cohort study

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Introduction: There are few prospective studies of the health-related quality of life (HRQOL) post trauma. The aim of our study was to assess the HRQOL improvement of trauma patients at 12 months after injury using the Short Form (SF-36) Health Survey, which is a patient-reported survey of the patient's health status.

Methods: A prospective cohort study was performed in our tertiary care hospital from September 2013 to January 2015. All consecutive trauma patients who were admitted to our department were included except for those under the age of 18, or with coexisting cognitive impairment, or deceased. SF-36 scores were obtained by direct interviews based on a standardized protocol at discharge and by mail at 6 and 12 months after injury. The primary outcome is 8 domain scores in SF-36. We followed their changes for 1 year. SF-36 scores were adjusted for age and gender.

Results: During the study period, complete data collection was achieved in 84 out of 119 patients. The median age was 68 years (interquartile range: 51 to 75), and 54 (60%) were male. Median ISS was 17.5 (IQR: 13 to 24), length of stay at our department was 21 days (IQR: 5 to 41) and total length of hospital stay was 51 days (IQR: 18 to 110). Although six of the eight SF-36 domains (Physical Functioning, Role Physical, Bodily Pain, Social Functioning, Role Emotional and Mental Health) improved significantly between discharge and 6 months after injury, there was no significant increase ($p<0.05$) in any SF-36 domains between 6 months and 12 months after Injury. All domain scores at 12 months after injury were lower than 50.

Conclusion: Domains at 12 months after injury were lower than national norms. The domain scores only improved within 6 months post trauma, when more than 80% of the patients had already returned home. Our results suggest that trauma patients need more HRQOL support in both social and mental status even after discharge.

	At discharge Median(IQR)	6 months after injury Median(IQR)	12 months after injury Median(IQR)
Physical Functioning	20(8,38)	42(32,52)*	44(35,56)
Role-Physical	19(4,31)	38(23,48)*	40(26,53)
Bodily Pain	35(29,43)	41(35,51)*	45(37,54)
General Health	46(39,53)	46(41,52)	47(40,57)
Vitality	42(31,49)	43(34,52)	44(39,52)
Social Functioning	33(18,45)	41(30,56)*	45(33,57)
Role-Emotional	33(18,52)	40(28,54)*	44(33,55)
Mental Health	39(31,49)	44(38,54)*	47(26,44)

*$p<0.05$ There was significant increase between at discharge and 6months after injury. There was no significant increase in all SF-36 domains between at 6 months and at 12 months after Injury.

Poster # 115

BIGGER IS BETTER: 10-GAUGE ANGIOCATHETER DECOMPRESSION OF TENSION HEMOPNEUMOTHORAX (t-H/PTX) AND RESCUE FROM TENSION-INDUCED PULSELESS ELECTRICAL ACTIVITY (PEA) ARREST IN A POSITIVE-PRESSURE VENTILATION YORKSHIRE SWINE MODEL

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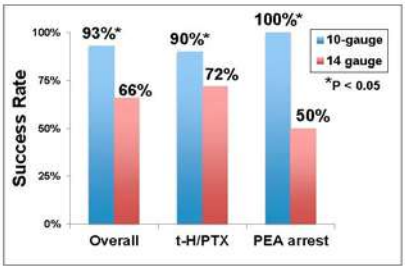
Introduction: Tension pneumothorax (tPTX) is a cause of potentially preventable death in pre-hospital and battlefield settings; however, traumatic PTX is frequently associated with a hemothorax (HTX). 14-gauge (14g) angiocatheter (AC) decompression is the current treatment standard, but has a high incidence of failure and no proven efficacy for associated HTX.

Methods: A t-H/PTX model was created through modification of our swine tPTX model. 10% estimated blood volume was instilled into each chest. Tension physiology was achieved with escalating CO2 insufflation and air leak simulated with intermittent flow. Needle decompressions with either 10-gauge (10g) or 14g AC were performed. After recovery, serial PEA events were induced and likewise decompressed. Success of rescue, time to rescue, and physiologic data were recorded. Necropsy was performed to assess catheter positioning and any iatrogenic thoracic injuries due to AC placement.



Results: 99 t-H/PTX and 43PEA events were conducted in 13 Yorkshire swine. 10gAC was dramatically more successful at rescue from both t-H/PTX or PEA,compared to 14g AC (Figure). The overall success rate was 93% for 10g vs only 66% for 14g ($p<0.01$). The median time to rescue for decompression of t-H/PTX was over twiceas long with 14g AC versus the 10g device (52 vs 22 secs, $p<0.01$). The incidence of successful rescue did not differ between anatomic location (mid-clavicular or axillary) for either device. Necropsy demonstrated no significant iatrogenic injuries. Failures appeared largely related to occlusion by blood or tissue, although a few catheters were kinked or malpositioned.

Conclusion: A 10g AC is superior to 14g AC for successful decompression of t-H/PTX and rescue from tension-induced PEA arrest in a positive pressure ventilation swine model. It also resulted in significantly faster rescue times versus the 14g AC, and was not associated with any identified major iatrogenic injuries. Further human studies are warranted to validate these findings and potentially field the 10g AC for military and civilian use.

Poster # 116

CLAMPING TRIALS PRIOR TO THORACOSTOMY TUBE REMOVAL AND THE NEED FOR SUBSEQUENT INVASIVE PLEURAL DRAINAGE

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Introduction: Clamping trials—a period of clamping thoracostomy tubes for a few hours prior to possible tube removal—may help reduce the likelihood of pneumothorax after tube removal, but there is little evidence for or against this practice. Prior to 2013, our trauma surgery services routinely performed clamping trials, but this practice ceased in 2013. We sought to evaluate whether thoracostomy tube clamping trials might reduce the need for subsequent pleural drainage procedures.

Methods: We conducted a single-institution, retrospective cohort study of all patients who underwent tube thoracostomy for traumatic injury from 7/2009-7/2012 and 7/2013-3/2015. We excluded subjects on positive pressure ventilation and those who had tubes placed during thoracic operations. We compared subjects who underwent a clamping trial to those who did not ("control"), using the time of clamping or tube removal, respectively, as the index time point and adjusted for confounding factors. The primary outcome was a subsequent invasive procedure to drain the ipsilateral pleural space within 30 days. Secondary outcomes within 30 days included subsequent: pneumothorax, effusion, or hemothorax; length of stay; and numbers of chest radiographs and CT scans.

Results: Of 985 subjects who underwent tube thoracostomy during the study period, 193 clamping trial and 228 control subjects met eligibility criteria. Mean age (38 ± 18 vs. 41 ± 18 years), sex (77% vs. 75% male), and proportion with penetrating injury (32% vs. 28%) were similar in the clamping trial and control groups, respectively. Chest Abbreviated Injury Scale score was lower in the clamping trial group (3.3 ± 0.7 vs. 3.6 ± 0.8). Rates of subsequent pneumothorax, effusion, or hemothorax were similar between groups [57 (29%) vs. 64 (28%); adjusted OR 0.90 (95% CI 0.57-1.42)], but clamping trials resulted in lower likelihood of a pleural drainage procedure [14 (7%) vs. 27 (12%); adjusted OR 0.43 (95% CI 0.20-0.92)]. Subsequent length of stay and number of chest radiographs were similar between groups, while clamping trials were associated with lower likelihood of a chest CT scan [14 (7%) vs. 36 (16%); adjusted OR 0.47 (95% CI 0.24-0.92)].

Conclusion: A clamping trial prior to thoracostomy tube removal reduced the need for subsequent pleural drainage procedures and CT scans of the chest.

Poster # 117

The Aging Methamphetamine Positive Trauma Patient: Increasingly Common, Increasingly Costly

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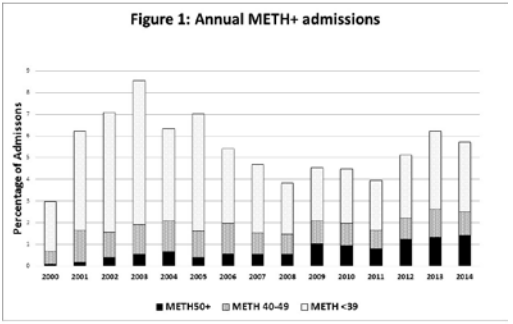
Introduction: Methamphetamine use creates a burden on our society and trauma systems. As the US population ages, we sought to determine the incidence of complications and utilization of resources by methamphetamine positive trauma patients age 50 to 75 years.

Methods: The trauma registry of a Level 1 Trauma Center with 33,036 admissions from 2000 to 2014 was used to compare demographics and mechanism of injury for patients 50-75 years with toxicology positive for methamphetamines and metabolites (METH50+). We compared the METH50+ group with a 3:1 cohort of toxicology-negative trauma patients matched by age, gender, mechanism of injury, and AIS/ISS. Length of stay (LOS), pre-existing conditions, recidivism, total hospital charges, discharge disposition, complications and payor information were analyzed.

Results: There were 247 METH50+ trauma patients, increasing from 0.32% of admissions age 50 years and older in 2000 to 2.9% in 2014 (Figure 1). METH50+ patients suffered more interpersonal violence and self-inflicted injury than non-users (23.1% vs 9.0%; p<0.001). In comparison to matched controls, METH50+ had longer median LOS (2.26 vs 1.97 days; IQR: 4.45 vs. 3.69, p=0.026) and higher hospital median charges ($37,806 vs. $31,456; IQR: $54791 vs $36686, p<0.001) and payors were more likely to be self-pay, Medicaid, Medicare or county welfare than to be private insurers (76.6% vs. 65.8%; p<0.001. METH50+ patients were more likely to have preexisting renal (4.0% vs. 1.5%; p=0.02) and liver conditions (8.4% vs. 4.7%; p=0.031). Complications more likely to occur in the METH50+ patients included vascular complications (5.2% vs. 2.5%, p=0.038), thrombus or embolus (4.9% vs. 2.3%; p=0.039), errors in technique (2.8% vs 0.4%; p=0.001) and provider-related errors and delays (22.2% vs. 15.8%, p=0.026). Same-center trauma recidivism was similar in METH50+ and matched controls (0.7% vs. 0.4%, N.S.).

Conclusions: Urine toxicology of trauma patients 50-74 years reveals increasing methamphetamine use. METH50+ screening identifies a patient group with higher charges, less insurance coverage and more complications that impact healthcare quality indicators. Opportunities exist for provider education and preventive interventions.



Poster # 118

Ballistic thoracic trauma over forty years in an urban trauma center

Keith R. Miller MD, Glen A. Franklin* MD, Matthew V. Benns* MD, Matt C. Bozeman MD, Brian G. Harbrecht* MD, Nicholas A. Nash MD, Jason W. Smith* MD, J. David Richardson* MD, University of Louisville

Introduction:
Although the practice of surgery continues to trend towards less invasive techniques, traditional operative techniques including thoracotomy and laparotomy have remained the mainstays of emergent trauma management. Historically,however, operative intervention has been required in the minority (15%) of patients sustaining ballistic chest trauma as most are managed with chest tube insertion alone. Over the last forty years, significant increases have been observed throughout the United States in the manufacture, sale, and utilization of higher caliber weaponry. Changes in injury patterns in the setting of ballistic chest trauma over this same time period have not been described. We hypothesized that the increasing caliber of weaponry over the study interval would result in increased invasiveness in the management of ballistic chest trauma.

Methods:
Retrospective chart analysis of thoracic gunshot wounds from the gunshot registry of an urban level I trauma center was performed over four decades.

Results:
The overall number of patients treated for ballistic chest trauma did not change. However, need for major operative intervention (laparotomy or thoracotomy) has increased to include nearly half (47%) of patients. The majority of this pattern is a result of increased requirement for pulmonary resection, concurrent laparotomy for abdominal injuries and delayed intervention for retained hemothorax. Cardiac injuries have become infrequent. Mortality is unchanged.

	1973-1975	**1987-1989**	**2006-2008**	**2013-2015**
Total Cases (avg/yr)	136 (45.3)	103 (34.3)	111 (37)	122 (40.6)
Thoracotomy	17 (12.5%)	11 (10.7%)	22 (19.8%)	19 (15.6%)
Delayed VATS	0 (0 %)	5 (4.9%)	18 (16.2%)	8 (6.6%)
Cardiac Injury	17 (12.6%)	19 (18.4%)	4 (0.4%)	3 (2.5%)
Pulmonary Resection	0 (0%)	1 (0.01 %)	17 (15.3 %)	7 (5.7%)
Operative Intervention	26 (19%)	30 (29%)	44 (40%)	57 (47%)
Overall Mortality	27 (20%)	16 (15.5%)	18 (16.2%)	23 (18.8%)

Conclusion:
Manufacture, distribution, and characteristics of firearms involved in crime have shifted towards larger caliber weaponry over the last forty years. Operative intervention in the post-injury period has increased dramatically and is attributed primarily to three variables: pulmonary resection, concurrent laparotomy, and need for delayed VATS in the setting of retained hemothorax. Cardiac injuries have essentially disappeared, presumably related to non-survival in the setting of higher caliber weaponry.

Poster # 119

THE USE OF SINGLE DOSE CEFAZOLIN FOR TUBE THORACOSTOMY PLACEMENT REDUCES CULTURE PROVEN PNEUMONIA

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Introduction:
The 2001 EAST Practice Management Guidelines stated insufficient evidence to suggest prophylactic or presumptive antibiotics for tube thoracostomy (TT) and the most recent consensus in 2012 mirrors that there is still insufficient evidence to make a recommendation. We reviewed our 7 year experience after changing our protocol from no antibiotics to a single dose of cefazolin for TT placement.

Methods:
A comparative effectiveness study was performed utilizing our National Trauma Databank. Trauma patients who had TT between February 2007 and December 2014 were collected. We excluded patients who died within 3 days of TT insertion. Primary endpoints were empyema with positive pleural cultures and pneumonia confirmed by bronchoalveolar lavage (BAL) cultures. Patients who were allergic to cefazolin or who had received antibiotics for other injuries within three hours of TT placement were analyzed in the antibiotic group. SPSS software was employed for analysis.

Results:
There were 401 patients, of whom 49 had TT placed before transfer and were excluded, leaving 352 patients; 183 received antibiotics within 3 hours of TT (CTAB) and 169 did not (CTN). Demographics were similar in ISS (22.8 and 23.4), age (50.4 and 47.4), and mechanism (79.8 and 79.5% blunt). The rate of empyema was 2.8% (n=5) in CTAB and 4.7% (n=8) in CTN. There was no difference in outcomes with ED, ICU or floor TT placement. There was a statistically significant reduction of pneumonia from 13.5% (n=23) in CTN to 6.1% (n=11) in CTAB (odds ratio =0 .4895% CI .001 – 77.1%). There was actually a reduction in resistant organisms in CTAB cultures but this was not significant [16 (8.8%) in CTAB compared to 18 (10.6%) in CTN].

Conclusion:
Consistent with prior studies we found a reduction in pneumonia. For empyema, we would need 20 years of data to achieve statistical significance. This study adds to the current role of antibiotics in TT by using cultures for diagnosis and only a single dose of antibiotics. Because the benefit of TT antibiotics was unchanged and there was reduced bacterial resistance, the single dose protocol is equal to and likely better than 24 hours.

Poster # 120

COMBAT MORTALITY INDEX (CMI): AN EARLY PREDICTOR OF MORTALITY IN COMBAT CASUALTIES

Tuan D. Le MD, DrPH, Jennifer M. Gurney* MD, Elizabeth A. Mann-Salinas Ph.D.,RN, Kirby R. Gross* MD, Stacy A. Shackelford* MD, Kevin S. Akers MD, Kevin K. Chung MD, Zsolt T. Stockinger* MD, United States Army Institute for Surgical Research

Introduction: Early detection of hemorrhagic shock has a discernable impact on timely interventions and can mitigate mortality risk. The current Shock Index (SI)lacks reliable predictive capacity and the anatomic-based scoring systems have limited applicability in the forward-deployed setting. We propose a Combat Mortality Index (CMI) that is rapid, easy to determine, has prehospital and hospital-based components. The CMI reliably predicts early mortality, and enables early identification of combat casualties at risk for mortality in the battlefield environment.

Methods: Data were obtained from the JTS Role II Registry. Inclusion criteria were age ≥18, injured in Afghanistan from 1/2008 to 9/2014, treated at a Role II facility (R2), and complete data of the variables tested. We constructed a new SI profile using vitals (SBP, HR, GCS) and routine labs (BD and INR) (Table 1). The CMI was constructed in two models for pre- and in-hospital (PH and IH) assessment and defined as a sum of defined parameters. The CMI-PH & IH were compared to the existing revised trauma score (RTS), field triage score (FTS), and SI. Area under the ROC curve (AUROC) and Hosmer-Lemeshow test were used to discriminate and calibrate the CMI(s) from the existing indices. Logistic regression was used to calculate the likelihood of mortality.

Table 1. Markers to be validated as a predictor of combat-related mortality in patients who arrived at Role II Afghanistan

Marker	Definition	AUROC (95% CI)
RTS	0.9368*GCS-Total+ 0.7326*SBP + 0.2908*RR	0.79 (0.71-0.86)
FTS	SBP≤100 and GCS-Motor <6	0.87 (0.79-0.94)
SI	HR/SBP: >0.9 or <0.5	0.74 (0.65-0.84)
CMI-PH	HR={0,1} + SBP={0,1} + GCS-total={0,1,2} *HR scaled 0 to 1 as 60-100 and <60 or >100 bpm, SBP scaled 0 to 1 as ≥100 and <100 mmHg. GCS-total scaled 0-2 as ≥14, 9-13, and 3-8.*	0.90 (0.85-0.96)
CMI-IH	HR={0,1} + SBP={0,1} + GCS-total={0,1,2} + BD={0,1,2} + INR={0,1,2} *HR, SBP, and GCS-total defined as CMI-PH. BD scaled 0 to 2 as >-2.0, -2.0–-5.0, and <-5.0. INR, scaled 0-2 as <1.5, 1.5-2.0, >2.0.*	0.96 (0.94-0.98)

Abbreviations: RTS, revised trauma scale; FTS, Field triage score; SI, shock index; CMI, Combat Mortality Index; CMI-PH, CMI- for pre-hospital assessment; CMI-IH, CMI- for in-hospital assessment; GCS, Glasgow coma scale; SBP, systolic blood pressure; RR, respiratory rate; HR, heart rate; bpm, beat per minute; BD, base deficit scaled; INR, International Normalized Ratio; AUROC, Area under the Receiver Operating Characteristic Curve.

Table 2. Mortality rate (%) at Role II Afghanistan by CMI models (-PH and -IH)

Score	CMI-PH (%)	CMI-IH (%)
0	0.1	0
1	1.3	0.1
2	7.1	1.5
3	19.7	1.9
4	–	6.3
5		11
6		23.8
7		27.3
8		–

Abbreviations: CMI, Combat Mortality Index; CMI-PH, CMI-pre-hospital (5 scores ranged 0-4); CMI-IH, CMI in-hospital (9 scores ranged 0-8).

Results: 4240 patients met inclusion criteria. Overall mortality was 1.30% (n=55). For CMI-PH model (5 scores ranged 0 to 4), 9.2% patients presented at R2 with CMI-PH score of 2 & 3, accounting for 7.1% and 19.7% mortality. For CMI-IH model (9 scores ranged 0 to 8), 7.9% patients had CMI score 4 to 7, accounting for an incremental mortality rate from 6.3% to 27.3%, respectively (Table 2). AUROC showed the CMI(s) are better predictors of mortality (Table 1) and better fit than other tested indices. Increase in the CMI score was also associated with increase in mortality.

Conclusion: The CMI is a rapid, accurate, reproducible, and 'user friendly' scoring system that may help predict combat casualties at risk for early mortality. This score has potential battlefield implications from triage, to the use of pre-hospital blood and hemostatic agents, to expeditious evacuation. Additional analysis should be performed in the pre-hospital setting, and for combat casualties presenting to a Role III combat support hospital, as well as in civilian trauma patients.

Poster # 121

REDUCTION OF FATALITIES AND INJURIES RELATED TO MOTOR VEHICLE COLLISIONS FOLLOWING SPEED LIMIT REDUCTION IN NEW YORK CITY: A PRELIMINARY REVIEW ONE YEAR LATER

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Introduction: Despite major reductions in associated injuries and deaths, there are 2.9 million injuries and 40,000 deaths annually related to motor vehicle collisions (MVCs) in the US. In Sweden, traffic fatalities have decreased 30% since 1997 following a speed limit reduction initiative. Largely based on the Swedish initiative, in 2014 New York City (NYC) adopted Vision Zero (VZ), an action plan to end traffic fatalities and injuries primarily by decreasing the speed limit from 30 to 25 mph. We hypothesize VZ would result in significantly less injuries and deaths related to traffic MVCs.

Methods: Using public NYC OpenData data sets, we reviewed all MVCs in NYC provided by the Police Department from 12 months before and 12 months after the initiation of the speed limit change on November 6, 2014. US Census population estimates for NYC for the study period were used to calculate incidence of injured and killed persons, injured and killed pedestrians, and injured and killed motorists. We then compared this data between the two 12-month periods.

Results: There was an overall significantly decreased rate of incidence of fatalities and injuries. See Table 1 below.

	Year Before VZ (n=206,832)	Year After VZ (n=214,874)	*p* value
Accidents Involving Injured Persons	37883 (18.32%)	37327 (17.37%)	<0.01*
Incidence Rate of Injured Persons (per 100,000)	615.98	597.16	<0.01**
Accidents Involving Killed Persons	274 (0.132%)	226 (0.105%)	0.010*
Incidence Rate of Killed Persons (per 100,000)	3.43	2.74	0.012**
Incidence Rate of Motorists Injured (per 100,000)	317.62	428.96	<0.01**
Incidence Rate of Motorists Killed (per 100,000)	1.37	1.08	0.095**
Incidence Rate of Pedestrians Injured (per 100,000)	132.05	119.47	<0.01**
Incidence Rate of Pedestrians Killed (per 100,000)	1.82	1.46	0.067**

*=Pearson's Chi Square **=Two Population Proportion Test

Conclusions: Based on census estimates, a decrease in the NYC citywide speed limit from 30 to 25 mph for one year was associated with a significantly decreased rate of incidence in overall fatalities and injuries, pedestrian injuries, and a strong trend toward decreased pedestrian fatalities. This preliminary report suggests VZ may be successful; however, further study over an extended time period is warranted to verify these findings.

Poster # 122

PATIENT COMPREHENSION AND COMPLIANCE WITH POST-SPLENECTOMY INFECTIOUS RISK REDUCTION

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Introduction: Patients undergoing splenectomy are at life-long risk for developing episodes of rapidly progressive septicemia known as Overwhelming Post-Splenectomy Sepsis (OPSS). In an effort to reduce risk, splenectomy patients are recommended to receive vaccinations against pneumococci, meningococci, *Haemophilus influenza* type b, and influenza virus. Patients should also be placed on an appropriate re-vaccination schedule and receive education regarding the importance of fever or infectious symptoms given their asplenia. However, as most patients do not follow up with their trauma providers beyond their initial period of injury convalescence, little is known about compliance in regards to post-splenectomy risk reduction over time. The purpose of this study was to investigate long term patient understanding and follow-up with recommendations regarding their asplenia.

Methods: All patients undergoing splenectomy for trauma over a 5 year period (1/1/2010-12/31/2014) were analyzed. Medical records were reviewed and telephone follow-up interviews were conducted from 10/2015-12/2015. Patients were excluded from further analysis if they could not be reached for interview after three attempts. Patients were asked a standard set of questions that included hospitalizations since their original admission, awareness of the infectious risks associated with asplenia and the need for re-vaccination, how they were informed of the risks of asplenia, and what type of vaccines they had received since their index hospitalization.

Results: 236 patients underwent splenectomy during the study period. All patients received initial vaccinations prior to discharge. All patients had a documented discussion from a trauma practitioner, as well as written information provided at discharge regarding their condition and the vaccinations they had received. A total of 90 patients (38%) were successfully contacted and included in the study. 27 patients (30%) had been hospitalized since their trauma admission. 11 of those patients (40.7%) were admitted for various infections, including 5 patients with pneumonia and 1 patient with meningitis (concomitant brain injury with history of instrumentation). None of these patients described having OPSS. Only 44.4% of patients were aware of the risks of asplenia and the need to re-vaccinate. Among those aware, only 14.9% recalled being educated prior to discharge, with the majority (51%) stating they learned from their primary care provider. The majority of patients (64.3%) greater than 5 years out from their splenectomy had not been appropriately revaccinated for pneumococci. Nearly half (46.6%) of patients had not received an influenza vaccine.

Conclusion: Despite uniform education prior to discharge, most patients undergoing splenectomy for trauma at our institution were unaware of the risks of OPSS and did not follow recommended guidelines for risk reduction. Though OPSS is rare, it carries a significant mortality. Further studies targeting methods to improve compliance with recommendations are indicated.

Poster # 123

DEFINING EXPERT DECISION-MAKING FOR THE MANAGEMENT OF TRAUMA PATIENTS

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Introduction: The management and outcome of trauma patients are heavily dependent onsound judgment and effective decision-making. Yet, current methods for training and assessing these advanced cognitive skills are subjective, lack standardization and are prone to error. This qualitative study aims to define and characterize the high-level cognitive competencies and other non-technical skills required to optimally manage injured patients.

Methods: Cognitive and hierarchical task analyses for managing unstable trauma patients were performed using qualitative methods to map the thoughts, behaviors and practices that characterize expert performance. Trauma team leaders and board-certified trauma surgeons participated in semi-structured interviews that were audio-recorded and subsequently transcribed verbatim. Verbal data were supplemented with content from published literature and prospectively-collected field notes from in-vivo observations of the trauma team during trauma activations. The data was coded and thematically analyzed using grounded-theory by two independent reviewers, and synthesized into a list of items and a conceptual framework.

Results: A framework was created based on 14 interviews with experts (lasting 1-2 hours each), 35 field observations (20 (57%) blunt; 15 (43%) penetrating; median Injury Severity Score 20 [13-25]), and 7 literary sources. Experts included 11 trauma surgeons and 3 emergency physicians from seven Level 1 academic institutions in the United States and Canada (median years in practice: 12 [8-17]). Twenty-nine competencies were identified, including 17 (59%) related to situation awareness, 6 (21%) involving decision-making, and 6 (21%) requiring other non-technical skills. These competencies were categorized into 13 themes: “physiologic burden” (N=6), “mechanism” (N=2), “injury and pattern recognition” (N=1), “active and confirmatory reconciliation” (N=2), “data processing and metacognition” (N=2), “environmental limitations” (N=2), “self limitations” (N=2), “leadership” (N=3), “teamwork and communication” (N=3), “forward planning” (N=2), “managing the injury” (N=2), “prioritizing” (N=1), and “escalation of aggressiveness” (N=1). Of 42 potential errors that were identified, root causes were mapped to errors in situation awareness (20 (48%)), decision-making (11 (26%)) or other non-technical interpersonal skills (11 (26%)).

Conclusion: This study defines cognitive and other non-technical aptitudes that are essential for the management of trauma patients. This framework may serve as the basis for novel curricula to train and assess advanced decision-making skills, and to develop quality-control metrics to improve team and individual performance and prevent errors.

Poster # 124

MORNING REPORT DECREASES LENGTH OF STAY IN TRAUMA PATIENTS BY CHANGING CARE PLANS IN 20% OF PATIENTS

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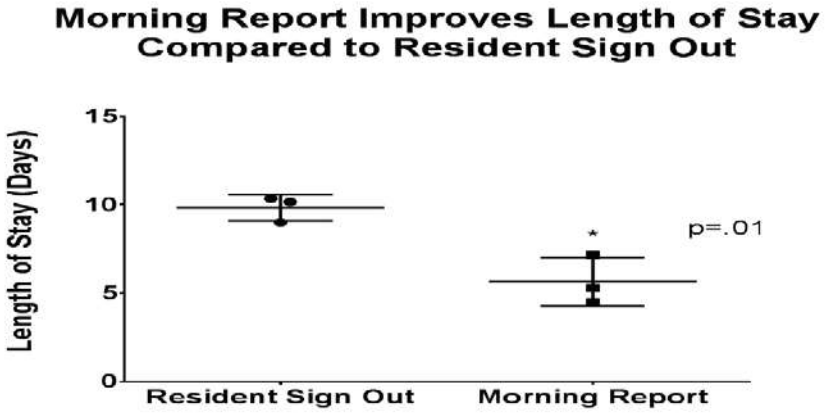
Introduction: Modern trauma surgery programs depend on consistent patient hand-offs to facilitate care as most programs have transitioned to shift based coverage. We sought to determine the impact of implementing a morning report process on length of stay and to prospectively collect changes to the plan of care.

Methods: Prior to the intervention hand-offs were communicated between resident teams without attending provider supervision and post intervention hand-offs were completed between resident teams with oversight from 3 attending surgeons (night call, trauma day call, and emergency general surgery day call). Changes to the plan of care were collected prospectively by an advanced practice nurse and retrospectively classified into the following categories: medication changes, addition of a procedure, avoidance of a procedure, protocol deviations, and other. Data collection for the study lasted 90 days.

Results: During the study period 71 surveys were completed (79% response rate) detailing 219 trauma admissions (152 Floor (69.4%) and 67 ICU (30.6%). Changes to the plan of care occurred in 44 patients (20%). The most common change (n=20, 45%) was the addition of a procedure, followed by medication changes (n=15, 34%). With medication changes, most were changes in pain management. Using Student's t-test, the mean length of stay for the study period was 5.6 + 1.3 days and was significantly decreased compared to the same 90 day period the previous year 9.8 + 0.7 days (p=.01).



Conclusion: Implementation of an attending supervised, trauma, morning report is associated with a decreased length of stay and changes to the plan of care in 20% of patients. The most common changes that occurred during this hand-off were the addition of procedures and changes in pain management. Further work needs to be done in this area to determine how changes to the plan of care impact length of stay.

Poster # 125

HOSPITAL-BASED VIOLENCE INTERVENTION PROGRAMS: A MULTI-INSTITUTIONAL ANALYSIS OF OUR TARGET POPULATION AND THEIR NEEDS FOR RISK REDUCTION

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Introduction: Homicide is the leading cause of death in African Americans (AA) aged 15-24 years and second in Latinos. Hospital-based violence intervention programs have been established to reduce future risk of violently injured individuals. To date, comprehensive information regarding the population and needs these programs address is lacking. The National Network of Hospital Based Violence Intervention Programs (NNHVIP) is an organization for programs that provide culturally competent case management and work to address risk factors associated with violent injury. The aim of this multi-institutional feasibility and utility study is to identify enrollment characteristics, patterns of bellwether needs, and differences amongst our cohort of clients in six of the founding NNHVIP programs.

Methods: Client data on demographics and needs were prospectively entered into a centralized database. Continuous variables were compared using ANOVA while nominal variables were compared using Fisher exact test. Ethics approval was obtained for all six programs. Chi squared analysis was used to test associations between observed and expected frequencies.

Results: Over a 5-year period, 4366 clients were included, 81.7% of which are male. The majority (64%) were African American (AA), followed by Latinos (22.4%), and Whites (8.2%). Gunshot Wound (GSW) was the most common mechanism (42.9%), followed by stab wounds (35.7%). GSW comprised 57.9% of injuries among AAs, but only 35.7% of Latinos, who were primarily victims of stabbings (55.6%). Women comprised 18.3% of clients, consistent among races (p=0.86). Women were more likely to be victims of blunt assault (p = 0.0005). 2839 of the clients were 18 to 35yo. When regional differences were assessed, the East Coast programs had a higher proportion of African Americans (67.5%) than West Coast programs (38.6%). There were no regional differences based on gender. Representation by race among bellwether client needs that programs work to address were statistically significant (see table).

Conclusion: Hospital-based violence intervention programs principled in the public health model continue to emerge. As these programs grow in size and number nationally, it is critical to understand characteristics of our clients and their needs which if addressed could mitigate future violent injury risk. This multi-institutional study identifies AA as having higher than expected need for employment and mental health whereas Latinos had higher than expected need for mental health, education and housing. In response to these findings, focused resource allocation, culturally appropriate case management, and advocacy efforts can be more effective in strengthening these programs and counseling fledgling programs in an ultimate effort to reduce violent injury in our most vulnerable populations.

Chi-Squared Analysis of association of observed and expected frequency of needs

	African American		Latino		Other		Total		
Service Needed	n	%	n	%	n	%	n	%	p-value*
Mental Health	298	63.7	137	29.3	33	7.1	468	100	<0.0001
Education	137	56.9	80	33.2	24	10.0	241	100	<0.0001
Employment	165	72.1	44	19.2	20	8.7	229	100	0.009
Housing	158	58.7	83	30.9	28	10.4	269	100	0.002
All Clients	2096	64.0	743	22.7	489	14.9	3274	100	

Poster # 126

TRAUMA READMISSIONS IN THE UNITED STATES: AN INVESTIGATION OF THE NATIONAL READMISSION DATABASE

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Introduction: Rates of trauma readmissions and risk factors for readmission across the United States has not been well studied to date. The recent release of the National Readmission Database will allow for more detailed analyses on trauma readmissions. Our aim was to analyze the National Readmission Database for trauma readmissions to find patterns and risk factors for readmissions.

Methods: We used the 2013 National Readmission Database from the Healthcare Cost and Utilization Project. We included all admissions with a primary diagnosis of trauma and linked all readmissions, regardless if to a different hospital, to the first admission. We excluded all patients younger than 18 years and weighted the data per the National Readmission Database protocol. We performed univariate and multivariate regression analyses to determine if readmissions were associated with patient characteristics, hospital characteristics, injury characteristics, and outcomes.

Results: The database captured a total of 35,580,348 admissions in 2013, 14,325,172 (40.2%) had a primary diagnosis of trauma. Of these, 3,814,170 (26.6%) experienced one or more readmissions to any hospital within a one year period. The longer the length of stay, the higher likelihood of readmission (p=0.000). Those aged 75-85 years had higher rates of readmission compared to all other age groups (p=0.000). Hospitals in an urban setting had higher rates of readmission compared the rural setting (p=0.000), as did patients who were discharged home (p=0.000). Private hospitals had higher rates of readmission, compared to government (p=0.000). Injury severity score 15-26 is also associated with higher rates of readmission. There was no significant difference in readmission with median household income (p=0.6).

Conclusions: Readmissions after trauma are common across the United States and with the recent release of the National Readmission Database, this study is the first of its kind to assess nationwide readmission rates and risks in more detail. Our study highlights that private hospitals and those in urban areas have higher rates of readmission. The reasons for these differences requires further research.

Poster # 127

HELMETS MATTER: KENTUCKY MOTORCYCLE CRASHES SEEN AT A TENNESSEE TRAUMA CENTER

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Introduction: Motorcycle crashes have increased nationwide since the mid-1990s. Motorcycle helmet laws vary by state with Kentucky requiring helmets only for younger riders. A Tennessee Level 1 trauma center catchment area includes southeast Kentucky and southwest Virginia. We hypothesized that motorcyclists injured in Kentucky and seen at a Tennessee trauma center would more likely be unhelmeted, have more severe head and neck injuries, and be fatalities than those injured in Tennessee or Virginia.

Methods: A Trauma Registry review of 729 injured motorcyclists from January 2005 through June 2015 examined state location of accident, demographics, helmet use, markers of injury severity, operative procedures, lengths of stay, and clinical outcomes. Multivariate logistic regression analysis controlling for gender, injury severity, and comorbidities evaluated predictors for head and neck injury severity and death with $p< 0.05$ significant. Current state motorcycle helmet laws were reviewed.

Results: Unhelmeted motorcycle rider status predicted more severe head and neck injuries [relative risk 15.3, 95% confidence interval (CI) 1.5-1.9, $p<0.01$] and death [relative risk 4.2, 95% confidence interval (CI) 0.04-0.1), $p<0.01$]. Motorcyclists injured in the state of Kentucky and seen at a Tennessee trauma center were more likely to be unhelmeted ($p<0$ .05), require an operative procedure ($p< 0.05$), have more severe head and neck injuries ($p< 0.05$), have longer lengths of stay ($p<0.05$), and be fatalities ($p<0$ .05) than motorcyclists injured in Tennessee or Virginia. Motorcycle fatalities from Kentucky were younger and included more females than those injured in Tennessee or Virginia ($p<0.05$).

Conclusion: This single trauma center study lends support for maintaining and enforcing current universal helmet laws for motorcycle riders of all ages in states where they are in effect and highlights the need to upgrade helmet laws that apply only to some riders. Injury prevention efforts may include lobbying policy makers and safety advocates in the home state and in surrounding states to upgrade and enforce motorcycle helmet laws.

Poster # 128

MAINTAINING COMBAT READINESS OF ACTIVE DUTY ARMY SURGEONS

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Introduction: During the last 14 years, the military has been engaged in combat operations in the Middle East. Wartime casualty survival rates are the highest they have been in history. The unprecedented combat casualty survival is multifactorial and has resulted from multiple advances in the spectrum of battlefield care: from evacuation; to changes in transfusion practices; to improvements in protective body armor and vehicles. While not easily quantitated, the role of the combat surgeon is also fundamentally important to the improved survivability. Of the branches of the military, the US Army has the largest deployable surgical force. The purpose of this study was to examine the future readiness of Army surgeons. We evaluated deployments, surgical training, pre-deployment training, caring for trauma patients while not deployed, as well as comfort with deployment and trauma relevant surgical skills. We hypothesized that over the last 14 years, Army surgeons have developed 'combat trauma readiness' secondary to recurrent and multiple deployments and subsequent to this operational tempo, Army surgeons have maintained clinical readiness in combat-relevant trauma skills.
Methods: A detailed, voluntary and anonymous online survey was sent to active duty deployable Army surgeons. Questions were asked about surgery training, trauma experience, deployments, pre-deployment training, comfort with deployment-relevant trauma-skills, and perceived preparedness for deployment. Aggregate data were shared with military leadership, but all responses remained anonymous. The outcome measure of 'trauma readiness' was defined by: evaluating comfort with combat-trauma relevant procedures; comfort taking care of trauma patients; and readiness to deploy. Multivariate regression analysis was used to determine predictors of comfort with trauma care and ANOVA testing was used to compare trauma relevant procedure comfort amongst cohorts with different numbers of deployments; *p*-values were considered significant at $p < 0.05$. **Results**: 168 Army surgeons received surveys and 152 responded (91%). 46% of respondents reported that they cared for trauma patients on at least on a monthly basis. Multivariate predictors for surgeon comfort with trauma and performance of trauma operative skills included frequent deployments and caring for trauma patients while not deployed; these were statically significant ($p<0.05$) when adjusting for age, rank and pre-deployment training courses. At the time of their first deployment, 53% of surgeons were within one year of completing their residencies. 44% had deployed only to Forward Surgical Teams (Role 2), 39% deployed to both Role 2 and Role 3 (Combat Support) Hospitals, while 8.5% deployed only to the Role 3. 62% of Army surgeons did not attend surgery-relevant pre-deployment training prior to their first deployment and, for those who had pre-deployment training, it did not affect measures of 'trauma readiness' on univariate or multivariate analyses. **Conclusion**: Given the limitations of self-reporting, this analysis indicates that Army surgeons are comfortable caring for trauma patients and feel prepared to deploy. At the time of this survey almost, all of the respondents had deployed to a combat zone; however, the majority did not take care of trauma patients while not deployed. Thus, it appears that the combat operations and frequent deployments have been a powerful engine for trauma skills sustainment and readiness; however, as the deployment tempos decrease, future efforts should consider exploring supplemental and unique training platforms for continued readiness capabilities.

Poster # 129

CAN FIREFIGHTERS BE TAUGHT ULTRASOUND?

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Introduction: There are many reports of paramedics using prehospital ultrasound but there are no reports of its use by firefighters. The purpose of this study was to evaluate the feasibility of training firefighters to perform and transmit ultrasound in the field.

Methods: This prospective, IRB approved study involved three fire departments in which 54 firefighters were trained to use E-FAST[DT1] in the field. The firefighters went through a didactic session that reviewed the science of ultrasound, ultrasound technology and its indications. This session was followed by a practical training session in which they learned how to do the E-FAST exam. Next, each firefighter had to do at least 100 E-FAST scans on "normal" individuals and send those scans electronically to the proctor. The firefighters then underwent a written exam followed by a practical exam. The same proctor administered both exams.

[DT1]Define E FAST here Extended Focused Assessment With Sonography for Trauma

Results: All 54 firefighters passed the written exam with the lowest score of 84%. They all also passed the practical exam with no one requiring any further training. Passage of the practical exam included showing proficiency in doing the E-FAST as well as transmitting the data electronically to the hospital and hospital practitioner.

Conclusion: All the firefighters learned the skill of E-FAST and were able to transmit to the hospital. Even one year after the start of the trial, the firefighters have maintained their proficiency and have diagnosed not only pneumothorax, but also liver laceration in a 9 year old boy. This study shows that it is feasible to teach firefighters to do the E-FAST and be able to transmit the images to the hospital and providers.

Poster # 130

CT SCANS SHOWING CORONARY ARTERY CALCIFICATION IDENTIFIES PATIENTS AT RISK FOR MYOCARDIAL INFARCTION IN THE SETTING OF TRAUMA

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Background: A myocardial infarction (MI) occurring in the setting of recent traumatic injury can be a very serious and deadly complication. In recent years, cardiac gated CT scans have gained popularity as a non-invasive technique for predicting the risk of future cardiovascular events. With this technique, the amount of coronary artery calcification (CAC) is quantified and helps to accurately predict a future risk of MI. The association between incidentally noted CAC on CT scans obtained during trauma evaluations and risk of in-hospital MI has not been studied. Our hypothesis is that MI increases after trauma in those patients who have CAC seen on CT scan.

Methods: In a multi-institutional study involving three Level 1 trauma centers, we performed a seven year retrospective review (2007-2013) of all trauma patients greater than 55 years of age with a chest CT and diagnosis of in hospital MI. These cases were matched 2:1 with trauma patients without MI, by age and gender. Variables evaluated included previously identified coronary risk factors (hypertension, diabetes mellitus, dyslipidemia, current smoking and BMI) and CT findings of pulmonary artery enlargement, mild and severe coronary calcification, cardiac enlargement, and valvular calcification. Predictors of MI were assessed using conditional logistic regression. Data are presented as medians with interquartile ranges and odds ratios (OR) with 95% confidence intervals.

Results: Fifty-eight patients over age 55 with MI and a chest CT were identified. The majority (59%) were male, the median age was 80 (74, 86) years and median ISS of 17 (4,50). Univariable analysis confirmed that MI was associated with HTN (75% vs 56% p=0.02), smoking status (64% vs 35%, p<0.01), history of diabetes (35% vs 18% p=0.02), prior cardiac surgery (30% vs 15%, p=0.03), and severe coronary calcification (64% vs 44%, p=0.05), Fig 1. Multivariate analysis performed on the cardiac risk factors and on the radiologic risk factors was performed. Smoking (OR 3.65 (1.46, 9.10), p=<0.01), diabetes (OR 3.23 (1.07, 9.74) p=0.03) and severe coronary calcification (OR 2.20 (1.02, 4.71), p=0.04) were independently associated with an increased risk of MI.

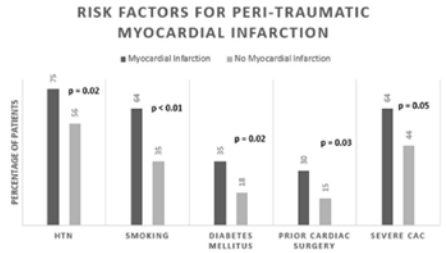

Fig 1

Conclusion: Coronary artery calcification on admission trauma chest CT is independently associated with an in hospital risk of MI after traumatic injury. Trauma patients who are found to have CAC should receive additional cardiac evaluation and treatment to prevent this potentially deadly complication.

Poster # 131

INJURY IN THE ELDERLY: A BURDEN ON AN INCLUSIVE TRAUMA SYSTEM

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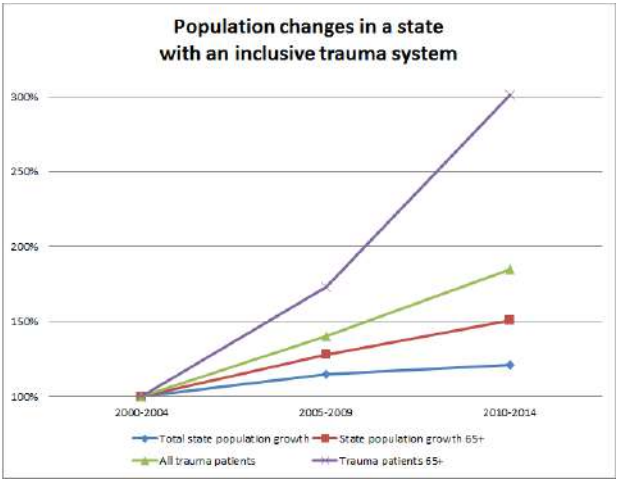
Introduction: The geriatric population is the fastest growing trauma population in the US. The elderly present a unique challenge to trauma systems due to their comorbidities and frailty. We sought to assess the impact of geriatric trauma on an inclusive trauma system since it's inception.

Methods: Our state trauma registry was queried for all patients aged 65 and older from 2000-2014. Data was divided into three five-year cohorts and groups were compared for demographic and outcomes variables. A combination of US census data and state data was used to compare general population changes with changes in the trauma population. Chi-squared test was performed on categorical variables. Continuous variables were compared with Kruskal Wallis and reported as median and interquartile range.

Results: During a 15 year period, 80,850 patients were cared for in an inclusive trauma system. 21,241 were 65 years and older. The proportion of trauma patients 65 years and older increased from 19.5% (3,699/19,017) in 2000-2004 to 24.1% (6,398/26,580) in 2005-2009 and 31.6% (11,144/35,253) in 2010-2014 (p<.001).



The total state population at the end of 2014 was 121% of the 2000 population. This rise was 151% for those 65 and older. While a general and significant increase in the total trauma population (185%) was noted during this time, visits by patients 65 and older in the 2010-2014 dataset were 301% of those in the reference set. Despite the two-fold increase in geriatric trauma patients, mortality of these patients decreased from 6.6% (n=243) in 2000-2004 to 5.2% (n=332) in 2005-2009 to 3.5% (n=391) in 2010-2014 (p<.001). Median injury severity score was 9, though interquartile range varied among groups. Length of stay also decreased from 5 days (3-8) in 2000-2004 to 4 days (3-6) in 2010-2014 (p<.001).

Conclusions: Trauma evaluations of elderly patients increased at twice the rate of the general population. Despite the increasing burden of geriatric trauma, care in a maturing inclusive trauma system was associated with decreased mortality and length of stay.

Poster # 132

THE PRICE OF ALWAYS SAYING YES: A COST ANALYSIS OF SECONDARY OVERTRAIGE TO AN URBAN LEVEL I TRAUMA CENTER

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Introduction: Level I Trauma centers serve as a community resource with documented survival advantages for a variety of critical injuries. Most centers generally employ an inclusive transfer acceptance policy that may result in overtriage of patients with minor injuries, particularly in rural environments. The financial burden that this imparts on an urban trauma system has not been well examined. We sought to examine the incidence of secondary overtriage (SOT) at an urban Level I trauma center as well as the financial cost associated with SOT.

Methods: This was a retrospective registry study from an urban Level I trauma center examining patients admitted as Trauma Transfers (TT) from 2010-2014. Demographics, injury characteristics, and interventions were collected in addition to hospital charges. SOT was defined as patients not meeting "Orange Book" transfer criteria and that had a hospital length of stay (LOS) of < 48 hours. Average Emergency Department (ED) and transport charges were obtained during the study period to allow for calculation of total transfer charges.

Results: A total of 2,678 TT were treated over the 5 year interval. The number of TT increased yearly over the study interval. Mean age of TT was 59.7 years (SD ± 27.1), patients were predominantly male (58.2%) Caucasians (82.7%), with at least one comorbidity (71.7%). Medicare (35.7%) and Private (33.9%) insurance were the predominant payor source. Blunt trauma accounted for 97.1% of admissions with a Median ISS of 9 (IQR 5-16). Predominant injuries were isolated Closed Head Trauma (59.6%), skin/soft tissue (19.2%), and spinal injury (17.2%). SOT was 53.7% overall and increased yearly ($p < 0.001$). SOT patients were significantly younger (54.4y vs. 66y, $p < 0.001$) had a lower median ISS (9 vs. 13, $p < 0.001$),less likely to require any intervention (1.9% vs. 27.3%, $p < 0.001$), and more likely to be discharged directly home (78.8% vs. 43.7%, $p < 0.001$) than those with justifiable transfers. Median trauma center charges for SOT patients were ($27,028 IQR $19,410-34,899) while ED charges were ($40,440 IQR $26,150-65,125) resulting in a total cost of $67,468/patient.

Conclusion: A liberal TT policy results in a high SOT rate at our urban trauma center adding significant unnecessary costs to the healthcare system. Collaborative efforts to establish effective transfer guidelines may allow for significant cost savings without compromising care.

Poster # 133

STAY LOCAL: RURAL TRAUMA CENTER DESIGNATION REDUCES NEED FOR PATIENT TRANSFER

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Introduction: Development of rural Level III trauma centers in a regionalized system may improve patient outcomes through improved early stabilization and prompt critical interventions. In addition, the resources to admit more patients to level III centers may benefit the patient as well as the trauma system by reducing the burden of inter-facility and, in our case, inter-island transfers. However, the impact on patient outcomes must be assessed. We hypothesized that the development and designation of Level III centers in an inclusive trauma system resulted in lower rates of transfer to higher level center, with no increase in morbidity or mortality among the non-transferred patients.

Methods: State trauma registry data from Jan 2009 through Sept 2015 were examined from 5 rural hospitals that transfer patients to our highest Level II urban hospital. These 5 rural hospitals began receiving state support in 2010 to develop their trauma programs and were subsequently verified and designated Level III centers (3 in 2011, 2 in 2013). Multivariate logistic regression was used to examine the adjusted odds of patient transfers or adverse patient outcomes, while controlling for patient age, gender, penetrating versus blunt mechanism, presence of a general head injury or traumatic brain injury, arrival by ambulance, and category of injury severity score. The study period was divided into “Before” rural Level III center designation (2009-2010), and “After” (2011-2015).

Results: A total of 7,445 patient records were included. There was a significant decrease in the proportion of patients who were transferred After (1,277/5,701) compared to Before (516/1,744) periods. While controlling for the above covariates, the odds of patient transfer were reduced by 34% ($p<0.0001$) during the After period. Among non-transferred patients, there were no significant differences in adjusted odds of mortality, or hospitalizations of seven days or more, Before versus After.

Conclusions: Development of rural Level III trauma centers in a regionalized system can significantly reduce the need for transfer to a remote, higher level trauma center. This may benefit the patient, family, and trauma system, with no adverse effect upon patient outcome.

Poster # 134

UTILITY OF THE MODIFIED EARLY WARNING SCORE FOR INTERFACILITY TRANSFER OF PATIENTS WITH TRAUMATIC INJURY

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Introduction: The modified early warning score (MEWS) is a "track and trigger" score based on standard physiologic vital signs. The objective of this study is to determine if the MEWS can be utilized by the receiving facility for predicting short-term clinical outcomes and secondary overtriage, or by the transferring facility for predicting optimal transport mode, risk for deterioration, and need for interventions in transit.

Methods: Included were all consecutively admitted trauma patients transferred into a level II trauma center in 2013 and 2014. Pre-transfer MEWS and decrease in MEWS in transport (MEWS deterioration) were calculated for each patient. Data were abstracted from the hospital's trauma registry and the EMS charts from the three leading agencies. Outcomes included mortality, complications, ICU admission, operative status, transport mode, MEWS deterioration, secondary overtriage (ISS ≤ 9, LOS ≤ 1 day, and discharge home), and in-transit event (interventions, complications, and change in vital signs in transit). We analyzed study outcomes using receiver operator characteristic (ROC) curves and ANCOVA.

Results: There were 652 transferred patients. The mean pre-transfer MEWS was 1.8 (1.2), and was missing in 11% of patients. Overall incidence of outcomes is shown in table 1. After adjustment, mean pre-transfer MEWS was positively associated with the following outcomes: mortality (expired, 3.94 vs. survived, 1.55, $p < 0.001$); ICU admission (admitted, 1.98 vs. not, 1.62, $p < 0.001$); complication (yes, 2.04 vs. no, 1.77, $p=0.04$); operative procedure (yes, 1.87 vs. not, 1.58, $p=0.046$). and transport mode (Air 2.3 or CCT 3.0 vs. ALS 1.6 or BLS 1.3, $p < 0.05$ for all comparisons). The mean pre-transfer MEWS was not significantly associated with secondary overtriage (yes, 1.66 vs. no, 1.84, $p=0.13$) or in-transit event (2.04 vs. 1.62, $p=0.08$). These findings persisted when examining the change in MEWS during transport for study outcomes. ROC analysis is shown in table 1 and demonstrates a pre-transfer MEWS < 4 had a specificity for survival of 94% and non-ICU admission of 97%.

Table 1. Pre-transfer Modified Early Warning Score (MEWS) ROC curve analysis

Outcome	Event %	AUROC (95% CI)	P value	Criteria	Sensitivity	Specificity	PPV	NPV
Mortality	6.6%	0.73 (0.69 – 0.76)	**< 0.001**	≥ 4	51%	94%	39%	96%
Complication	15.5%	0.56 (0.52 – 0.60)	0.07	≥ 4	16%	93%	29%	86%
ICU admission	50.6%	0.57 (0.53 – 0.61)	**0.002**	≥ 4	14%	97%	83%	53%
Operation	32.9%	0.52 (0.48 – 0.56)	0.33	≥ 2	51%	54%	35%	69%
Secondary overtriage*	21.8%	0.54 (0.50 – 0.58)	0.16	≤ 1	58%	49%	24%	81%
Helicopter transport	18.4%	0.62 (0.58 – 0.66)	**< 0.001**	≥ 2	64%	56%	25%	87%
MEWS Deterioration	22.6%	0.59 (0.55 – 0.63)	**0.001**	≤ 1	63%	50%	27%	82%
In-transit event**	16.9%	0.61 (0.52 – 0.69)	0.07	> 1	56%	62%	23%	87%

*secondary overtriage: ISS ≤ 9, LOS ≤ 1 day, and
**In-transit event: intervention, complication, change in vital sign, procedure in-transit from

Conclusion: The pre-transfer MEWS can be utilized by the receiving facility for predicting in-hospital mortality and for allotment of OR and ICU resources, particularly scores ≥ 4. The pre-transfer MEWS appeared to be less useful for the sending facility in identifying appropriate transport mode and risk for deterioration and in-transit events during interfacility transfer.

Poster # 135

WHO ADMITS SEVERELY INJURED TRAUMA PATIENTS? REVIEW OF 201,636 PATIENTS IN A POPULATION-BASED DATASET

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Introduction: Severely injured trauma patients ("ISS>15") are generally thought to require admission to Level I or II trauma centers (I/II TC). Few national data exist to confirm whether this is occurring. The objective of this study was to determine where these patients are admitted.

Methods: Adult "ISS>15" were selected from the 2012 National Emergency Department Sample. After excluding ED deaths, transfers, and discharges, we examined where "ISS>15" patients were admitted: I/II TC vs "OTH" (all others). Weighted descriptive analysis examined demographic and clinical characteristics. Multivariable logistic regression was used to predict "OTH" admission, adjusting for patient and hospital characteristics.

Results: Of 201,636 severely injured ED visits, 76,305 (37.8%) were evaluated in "OTH" with 1,059 (1.4%) ED deaths, 22,794 (29.9%) transfers and 15,008 (19.7%) ED discharges. 37,445 (49.1%) were admitted to "OTH" with 2,855 (7.6%) deaths and 1,848 (4.9%) eventually transferred to another hospital. Among the admitted, the odds of "OTH" admission were higher in women (OR=1.19; 95% CI=1.11-1.27), those covered by Medicare (OR=1.61; 95% CI=1.32-1.96), or uninsured (OR=1.53; 95% CI=1.14-2.05) compared to private insurance, and older age (85+ years had OR=2.61 (95% CI=1.98-3.44) compared with 16-25 years). Median income of zip code and region of country were not significantly associated with "OTH" admission while having multiple injuries was associated with decreased odds of "OTH" admission (OR=0.58; 95% CI=0.50-0.67).

Conclusions: Half of severely injured individuals presenting to "OTH" were admitted to "OTH" (19% of all ISS>15). Odds of "OTH" admission were higher in women, older individuals, Medicare insured, and the uninsured while the odds of "OTH" were lower in multiple trauma. Further research is needed to confirm these findings and determine why certain groups are more likely to be admitted to a facility incongruent with their injury severity.

Poster # 136

TRAUMA PATIENTS: "I CAN'T GET NO (PATIENT) SATISFACTION?"

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Introduction: The Center for Medicare and Medicaid Service (CMS) provides financial incentives to hospitals based on the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) patient satisfaction survey. Trauma patients are a unique population who are typically cared for by multiple services that potentially impact patient satisfaction. Trauma patients are traditionally viewed as having a negative impact compared to other groups on overall hospital patient satisfaction. Recent studies have shown patient satisfaction is impacted by the willingness of a physician to fulfill the patient's demands irrespective of its medical necessity, and the physician's ability to provide a favorable prognosis. Here we present the first study to specifically evaluate trauma patient satisfaction and hypothesize it will compare negatively to overall hospital patient satisfaction scores.

Methods: Three different analyses were performed. Group 1 was composed of **ALL** patients (trauma/non-trauma) admitted to our hospital over an 18 month period who were administered a validated patient satisfaction survey by a 3rd party (**ALL**). Group 2 compared admitted trauma patients, identified by trauma specific ICD-9 diagnosis codes (**ICD**), to identify disparities as they relate to diagnosis/prognosis. Group 3 consisted of the three Level I Trauma Centers in our area (**TC**). Patient satisfaction data of trauma vs. non-trauma patients (**ALL**), trauma specific diagnoses (**ICD**), and HCAHPS associated satisfaction across Level I facilities in our area (**TC**) was analyzed using the appropriate statistical test. A data mediated model for adjustment of patient satisfaction was developed to account for differences in prognosis in the **ICD** group.

Results: In the **ALL** group, no differences in satisfaction were noted in 18/21 questions for trauma patients when compared to non-trauma patients at our hospital. Patient satisfaction in the **ICD** group was worse in patients who carry a diagnosis of spinal cord injury compared to other trauma diagnoses. To adjust for **ICD** associated poor satisfaction, a complexity matrix was developed to allow comparisons across hospitals of varying injury severity and volume. Log transferred patient satisfaction scores in relation to complexity was found to have a strong polynomial fit of R2 0.5833. No difference was found in HCAHPS associated satisfaction between the three Level I Trauma Centers in our area (**TC**).

Conclusion: In contrast to the commonly held opinion, trauma patients do NOT negatively contribute to patient satisfaction in our facility. Certain injuries may offer opportunities for improvement. Our data demonstrate the current model of patient satisfaction is impacted by the prognosis and our risk adjusted model is the first to potentially balance for poor patient satisfaction due to **ICD** associated prognosis. In the era of public reporting and financial penalties, surgeons should embrace patient satisfaction as it may be vital to the survival of the trauma center.

Poster # 137

STATEWIDE ANALYSIS SHOWS COLLABORATIVE REGIONAL TRAUMA NETWORK REDUCES REGIONAL MORTALITY

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MetroHealth Medical Center

Introduction: Regional Trauma Network (RTN), composed of one level I and several lower level trauma centers (TCs) across multiple hospital systems, was established in 2010. This collaborative network utilized a unified triage protocol and a single transfer center. The impact of RTN was assessed by evaluating regional mortality changes before and after RTN establishment.

Methods: Patients in the state trauma registry with age ≥ 15 from 2006-2012 were analyzed; 2006-2009 and 2010-2012 were designated as pre-RTN and RTN periods respectively. Region was defined as a county containing level I TC (L1TC) and its adjacent counties. Any counties bordering multiple L1TC-containing counties were excluded from analysis. Mortality was compared for all regions before and after RTN implementation. The following subgroups were also included *a priori* for the comparison: Injury Severity Score (ISS) ≥ 15, age ≥ 65 , and trauma mechanisms.

Table 1

Region	Pre-RTN		RTN		
	deaths	total	deaths	total	p-value
A	891 (5.3%)	16927	701 (5.2%)	13516	ns
B	415 (5.2%)	7928	372 (6.5%)	5716	**0.001**
C	278 (3.2%)	8725	285 (4.6%)	6214	**<0.001**
D	462 (4.5%)	10266	365 (4.0%)	9223	ns
E	363 (5.5%)	6548	305 (5.4%)	5624	ns
RTN	886 (5.3%)	16583	610 (4.3%)	14178	**<0.001**

RTN: reginal trauma network; ns: non-significant

Results: 121,448 patients were analyzed; 66,977 and 54,471 patients were in the pre-RTN and RTN groups, respectively. Mean age was 58; 90% had blunt injuries. The overall mortality was 4.9%. Mortality comparisons over time for all regions are shown (Table 1). Additionally, RTN region was also the only region in the state that had mortality reduction in all patient subgroups. After adjusting for age, ISS, level of TC that performed treatment, and trauma mechanism, RTN implementation was an independent predictor of survival (odds ratio: 0.876; 95% CI: 0.771-0.995, p=0.04, c-statistic: 0.84).

Conclusion: RTN region was the only region in the state that had mortality reduction in all analyzed patient groups and RTN implementation was an independent predictor for survival. These suggest that regional collaboration and network-wide, uniform triage practices should be key components in the development of regionalized trauma networks.

Poster # 138

TRAUMA SURGEON TO PATIENT RATIO IMPACTS OUTCOMES AT HIGH VOLUME TRAUMA CENTERS

Ansab A. Haider MD, Peter Rhee* MD, MPH, Ahmed Hassan MD, Asad Azim MD, Terence O'Keeffe* MD, Andrew Tang MD, Lynn Gries MD, Gary Vercruysse* MD, Narong Kulvatunyou* MD, Bellal Joseph* MD, University of Arizona – Tucson

Introduction: Several studies have examined the relationship between trauma center volume and outcomes. None of the previous studies have examined if the number of trauma surgeons in relation to trauma center volumes contributes to trauma center outcomes. The goal of our study was to examine the relationship between trauma center volume and number of trauma surgeons and outcomes.

Methods: The National Trauma Databank was abstracted for all patients (≥ 18 years) treated at high volume trauma centers (≥1200 annual admissions) from the years 2011 and 2012. Patients who were dead on arrival and those with missing data points were excluded. Each center's annual volume of trauma admissions and number of trauma surgeons were used to create ratios. Multivariate regression analysis was performed for mortality after controlling for patient (age, gender, ISS, hemodynamics, GCS, emergent need for OR, insurance status) and hospital (level of designation, volume, trauma surgeon to volume ratio) characteristics to determine the most appropriate number of trauma surgeons.

Results: A total of 95,073 trauma patients from 30 centers were included. Mean age was 43 ± 18 years, 70.7% were male, and median [IQR] ISS was 9 [4-16]. The median number of trauma surgeons to volume was 0.0049 [0.0043-0.0064] which equates to a median of 1 trauma surgeon for every 205 trauma patients annually. The number of trauma surgeons to volume ranged from as low as 1 trauma surgeon for every 555 patients to as high as 1 trauma surgeon for every 105 trauma patients. 50% of trauma centers has less than 1 trauma surgeon for 205 trauma patients annually. Overall mortality rate was 3.2%. Multiple regression analysis revealed that patients treated at centers with a trauma surgeon to volume ratio of greater than 0.0025 had lower odds of mortality. This ratio equates to 1 trauma surgeon for every 400 trauma admissions annually. Patients treated at these centers had 23% lower odds of mortality (OR, 0.77; 95% CI, 0.66–0.91) than patients who are treated at centers with a lower trauma surgeon to volume ratio.

Conclusion: Trauma patients who are managed at centers that have a higher number of trauma surgeons relative to overall trauma admissions have better outcomes. At least 1 trauma surgeon for every 400 trauma patients maybe required to achieve optimal outcomes. This finding may provide additional information for trauma centers to obtain appropriate resource to adequately staff trauma centers.

Poster # 139

ALTERNATIVE PAYMENT MODELS: CAN (SHOULD) TRAUMA CARE BE BUNDLED?

Andrew J. Kerwin* MD, David J. Skarupa MD, Joseph J. Tepas* III, MD, Jin H. Ra MD, David J. Ebler* MD, Albert Hsu MD, Joseph Shiber MD, Marie L. Crandall* MD,MPH, University of Florida, Jacksonville

Introduction: Recent legislation repealing the Sustainable Growth Rate mandates gradual replacement of fee for service with alternative payment models (APM), which will include service bundling. We analyzed two years' experience at our state designated LI trauma center to determine the feasibility of such an approach.

Methods: De-identified data from all injured patients treated by the trauma service during 2014 and 2015 were reviewed to determine individual patient injury profiles. Using these injury profiles we created the "trauma bundle" by concatenating the highest AIS for each of the six body regions to produce a single "signature "of injury by region for every patient. These trauma bundles were analyzed by frequency over two years and by each year. The impacts of physiology and resource consumption were evaluated by determination of correlation of the mean and standard deviation of calculated survival probability (Ps) and ICU stay (ICU LOS) for each profile group occurring more than 12 times in two years.

Results: The 5813 patients treated over two years produced 858 distinct injury profiles, only 8% (69) of which occurred more than 12 times in two years. Comparison of 2014 and 2015 profiles demonstrated frequency variation among profiles between the two years. Analysis of injury patterns occurring >12 times in two years demonstrated an inverse correlation between mean and standard deviation for Ps (R2=0.68) and a direct correlation for ICU LOS (R2=0.84).

Conclusion: These data indicate that the disease of injury is too inconsistent a mix of injury pattern and physiologic response to be predictably bundled for an APM. The inverse correlation of increasing SD with increasing LOS ICU and decreasing Ps suggest an opportunity for measureable process improvement.

Poster # 140

DOUBLE JEOPARDY: OUT-OF-HOSPITAL AND INTER-HOSPITAL UNDERTRIAGE TO DESIGNATED TERTIARY TRAUMA CENTERS AMONG INJURED OLDER ADULTS – A 10-YEAR SPATIALLY-ADJUSTED STATEWIDE ANALYSIS.

Tabitha Garwe MPH, Ph.D., Kenneth Stewart MPH, Ph.D., Timothy Cathey MD, Julie Stoner Ph.D., Craig D. Newgard MD, MPH, Melissa Scott MA, Ying Zhang MS, Prasenjeet Motghare MPH, MBBS, John Sacra MD, Roxie M. Albrecht* MD, University of Oklahoma Health Science Center

Introduction: Out-of-hospital under-triage of older adult trauma patients to designated tertiary trauma centers has long been acknowledged. Transporting patients directly from scene to a Level I/II trauma center may be considered optimal but for predominantly rural regions where there may be need to travel long distances to a tertiary trauma center, trauma system effectiveness in improving outcomes may be largely predicated on rapid identification at the initial facility and transfer of patients requiring a higher level of trauma care. This study sought to determine the adjusted odds of treatment at a tertiary trauma center (TTC) for older adult trauma patients overall, from the scene of injury and via inter-hospital transfer from a non-tertiary trauma (NTTC) center.
Methods: This was a retrospective cohort study utilizing data from a statewide trauma registry reported over a 10-year period (2005-2014). Patients were excluded if they were 16 years old or younger (n=17498), had burn related injuries (n=1880), were transferred to or from an out-of-state hospital (n=15581). The outcome of interest was treatment at an ACS or state-designated tertiary trauma center (Level I/II). The predictor variable of interest was age group, dichotomously defined as older adult (age >=55 years) or young adult (age < 55 years). Covariates of interest included patient demographics, injury etiology, overall injury severity and by body region, physiology, transport mode, other clinical characteristics and distance measures. ArcGIS (ESRI) was used to geocode patients' injury location and to calculate driving distances from injury scene to designated trauma hospitals. Multivariable analyses were performed using logistic regression.
Results: 84 930 patients met study criteria. Of these 42% (35659) were aged 55 years and older with an average age of 74 years (SD, 11.6). Compared to their younger counterparts, older adult patients were significantly ($p < 0.05$) more likely to have severe (AIS >=3) head and extremity injuries, have pre-existing comorbidity and had a slightly lower average ISS (10.7 vs 11.5). No significant differences were noted in the average distance from the scene of injury to the closest trauma facility (any level), however, older adult patients were on average, injured slightly farther away from a TTC (47 vs 44 miles, $p<0.001$). Overall, disproportionately fewer older adult trauma patients were treated at a TTC (42% vs 65%). Although there was no difference in the rate of transfer by age group among patients initially presenting to NTTCs, older adult trauma patients were significantly more likely to be transferred to a NTTC (53% vs 34%). After adjusting for confounders and other predictors (including, distance measures and body region injured), older adult trauma patients were less likely to be treated at TTCs overall (OR=0.54, 95% CI: 0.52-0.56), whether transported by EMS from the scene of injury (OR= 0.47, 95% CI: 0.44-0.50) or via inter-facility transfer (OR= 0.63, 95%CI: 0.59 – 0.68).
Conclusion: Despite evidence demonstrating reduced mortality when treated at TTCs, older adult trauma patients face significant under-triage to such hospitals by EMS and via transfer from NTTCs. If outcomes in this high-risk population are to be improved, evidence-based geriatric-tailored pre-hospital and inter-facility trauma triage guidelines are urgently needed.

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(TAB #5)

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(TAB #5)

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As the former Chair of the AAST Research and Education Foundation I would like to thank all of our donors that have given so generously over the past 23 years. It was an honor and privilege to serve as chair of the foundation .

As announced at the 2015 AAST Annual Meeting the AAST Research and Education Foundation has transition from a traditional foundation to a restricted research and education fund. President Grace S. Rozycki has appointed a new AAST Research and Education Fund Committee and the current corpus continues as a separate restricted investment account. The process for collecting donation remains the same.

My challenge to the membership, and those committed to the advancement of Trauma and Acute Care Surgery research and education is to support the new AAST Research and Education Fund. I will be continuing my current $10,000 over five years pledge for an additional five year and I ask that each of you consider renewing your current pledge if you have one, or if not starting long-term pledge in 2016.

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Mike

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CARL P. VELENZIANO, M.D.

Carl Philip Valenziano, 64, of Hershey, PA, and formerly of Summit, NJ, and Mendham, NJ, died on Monday, August 24, surrounded by his loving family. Dr. V was an accomplished surgeon with more than 35 years of experience in the trauma and critical care fields, and past president of the American Trauma Society. He was an avid fisherman, Boy Scout, cook, and restorer of classic cars. His loud voice, big personality and ever-present camera will be deeply missed. Carl was preceded in death by his father, Frank Valenziano, and is survived by his mother, Mae Valenziano, devoted wife, Kate, five children, Nina Levy (Jay), Sarah (Miles Widstrom), Julia, Seth and Louis, three grandchildren, Max and Charlotte Widstrom and Temper Levy, four siblings, Philip (Maureen), Frank (Stephanie), Angela Ross (Scott), and Mark (Lori), many nieces, nephews, cousins, and many more members of a large and tight knit family.

MATTHEW L. DAVIS, M.D.

Matthew Lowell Davis, born July 29, 1974 in Galveston, Texas, died September 3, 2015 in the Sangre De Cristo Mountains in Colorado.

Matthew was preceded in death by his grandparents, Harvey and Leila Crumm of Alvin and Jon L Davis.

He is survived by his wife, Sharron; his son, Mason; his two daughters, Cecily and Elissa; his mother, Dr. Alma Crumm Golden and her husband Bruce Golden; his father, Dr. Mike Davis and his wife Deborah Davis; his sister, Barbara; his brothers, David, Daniel, Douglas, Jesse and Chris; and his grandparents, Minnie Lee Crumm of Alvin and Vera Guidry, as well as many other loving aunts, uncles, nephews, nieces and cousins.

Matt wore many hats throughout his life, but he pursued each role with intensity and compassion. Matt was a loving husband, a doting father, a caring son, a quintessential big brother, a fierce friend, a selfless servant, a gifted surgeon, and a fearless leader.

Matt's love for people, adventure, good jokes, good bourbon, mountains, his kids, and meal-time prayers were some his trademarks. His faith, friendship, courage, compassion and infectious laugh will be remembered forever.

He climbed mountains for the same reasons he treasured his wife for 20 years, loved his kids with all his heart and saved lives in the trauma unit – he was committed to the pursuit of a well-lived life for the glory of God, and he has accomplished it.

CHRISTOPHER D. WOHLTMANN, M.D.

SPRINGFIELD, IL - Christopher Wohltmann, M.D., 49, passed away at 6:24 a.m. on Tuesday, October 27, 2015, at Memorial Medical Center.

Christopher was born on December 27, 1965, in Utica, N.Y., the son of Charles and Angela Piatti Wohltmann. He married Marcia Mueller in St. Louis, Mo., on February 10, 1990, and she survives.

Dr. Christopher Wohltmann was the assistant professor of surgery for the Division of General Surgery at SIU School of Medicine. He was board certified in general surgery and surgical critical care. His specialty was general surgery, trauma surgery and surgical critical care. Prior to joining SIU, he was chief of the trauma service at William Beaumont Army Medical Center in El Paso, Texas. Dr. Wohltmann completed a fellowship in trauma and surgical critical care at the University of Louisville in Louisville, Ky. He completed his surgery residency at Robert Packer Hospital in Sayre, Pa. Dr. Wohltmann completed medical school at St. Louis University School of Medicine in St. Louis, Mo., and earned his undergraduate degree from the University of Notre Dame in South Bend, Ind.

Dr. Wohltmann was a Fellow of the American College of Surgeons and a member of the Society of Critical Care Medicine. He was a certified Advanced Trauma Life Support (ATLS) instructor and course director.

Dr. Wohltmann served in the U.S. Army as a Major from 1999 until 2003.

Christopher attended St. Agnes and was a fan of Notre Dame and the Yankees. He had a deep love for God, his family, and animals.

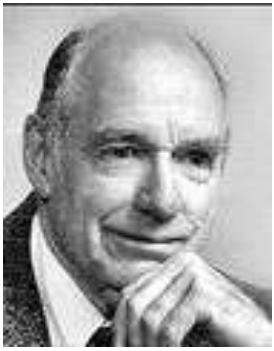
Christopher was preceded in death by two infant children, Christian and Victoria; his father; and brother, Kenneth Wohltmann.

He is survived by his wife, Marcia of Springfield; daughter, Grace Wohltmann of Springfield; son, Seth Wohltmann of Springfield; mother, Angela Wohltmann of Rochester, N.Y.; two siblings, Virginia Wohltmann of Rochester, N.Y., and Mary Wohltmann of St. Louis, Mo.; and two nephews, Steven and Nick Mueller of Ballwin, Mo.

SIDNEY F. MILLER, M.D.

Miller Dr. Sidney F. Miller, age 72, passed away on January 18, 2016. Preceded in death by his parents Joseph and Sarah Miller. He is survived by his wife, Babs Miller; daughters, Amy (Frank) Fiorella and Debra (Jim) Gaetano; sister, Elaine (Arthur) Atlas; grandchildren, Brooke Fiorella, Andrew, Jayson and Matthew Gaetano. Sid graduated from Indiana University Medical School. He practiced general surgery at Miami Valley Hospital and was a professor at Wright State University in Dayton, OH. Sid moved to Columbus to establish the Burn Center at The Ohio State University. He was also a Past President of the American Burn Assoc. He was active with the Columbus Jewish Federation, served on the board of the JCC Columbus and board of JCC Assoc. of North America. Sid traveled internationally teaching doctors how to establish burn centers.

ROBERT W. HOPKINS, M.D.



HOPKINS, Dr. Robert West 1924-2016. Professor Emeritus of Medical Science at Brown University and former surgeon and Acting Chief-of-Surgery at Miriam Hospital in Providence, Rhode Island, passed away peacefully on February 22 in his home in Milton, Massachusetts, with his devoted wife and daughters at his side. Born and raised in Longmeadow, Massachusetts, Robert was the son of the late Dr. Frederick Sherman Hopkins and Mary West Hopkins. A graduate of Classical High School in Longmeadow, Robert went on to attend both Harvard College (Class of 1945) and Harvard Medical School (Class of 1947). Robert became a surgeon, like his father and grandfather before him, completing his internship and surgical residency at the Massachusetts General Hospital before being called to serve as a lieutenant in the U.S. Navy in Korea. His duties as a surgeon on the hospital ship U.S.S. Repose earned him a Medal of Commendation from the United States Navy. Robert began his medical career at the Pennsylvania Hospital as assistant surgeon and instructor in surgery at the University of Pennsylvania Medical School. He moved to the Cleveland Metropolitan General Hospital in 1959, where he served as an associate surgeon from 1959-1970. While there, Robert served as Director of Graduate Education for the Department of Surgery and Chief of Trauma and Emergency Services. He was also an associate professor of surgery at Case Western Reserve University School of Medicine in Cleveland. In 1970, Robert moved to Providence, Rhode Island, where he was recruited by Dr. Fiorindo Simeone to play an instrumental role in developing Brown University's new medical program. Brown graduated its first class of physicians in 1975. Robert was Surgeon-in-Chief at the Miriam Hospital in Providence, Rhode Island, and joined the faculty of Brown University as Professor of Medical Science. In 1980, he became the medical director of the Miriam's Non-Invasive Vascular Laboratory, which was renamed the Robert W. Hopkins Non-Invasive Vascular Laboratory upon his retirement in 1996. While at the Miriam, he also served as a surgical consultant at Rhode Island Medical Center and Roger Williams General Hospital. Notably, Robert performed the first kidney transplant in Rhode Island in 1973 while at the Miriam. Robert was an active member of numerous medical societies, serving in leadership positions of several. He authored numerous professional publications. He was President of the American Cancer Society, Rhode Island Division from 1973-77. He was Vice-President (1982-1983), President-Elect (1988-1989), and President (1989-1990) of the New England Society for Vascular Surgery. He was Vice-President and then President of the Society of Medical Consultants to the Armed Forces (1982-1984). He was Vice-President of the New England Surgical Society from 1984-1985. Other medical societies in which Robert was active include: the American Surgical Association; the American Association for the Advancement of Science; the American Association for the Surgery of Trauma; the American College of Surgeons (both nationally and in the local chapter); the American Heart Association (Trustee of the Northeast Ohio Chapter, 1969-1971); the American Medical Association; the American Trauma Society; and the Society for Vascular Surgery (Distinguished Fellow). Even in his 90s, Robert continued to attend professional conferences and remained interested in the ever-evolving field of medicine. Robert is survived by his beloved wife of 56 years, Ann (Demetreou) Hopkins, two daughters, Mary Ann Hopkins, M.D., also a surgeon of New York City, and Elizabeth Hopkins Dunn and her husband Randall of Chicago, 2 granddaughters, Hunter and Chase Dunn, brother, Frank Hopkins and his wife Belva of Andover, sister, Martha Booth of CO, sister-in-law, Patricia Hopkins of IA, and his late brother Frederick.

ROBERT J. WHITE, M.D.

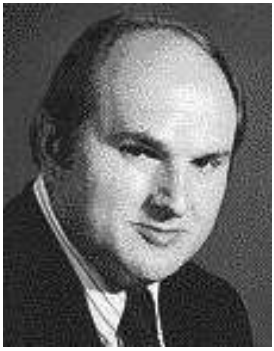
Geneva Township -- Dr. Robert J. White, who died today at age 84, liked to call himself "Humble Bob."

It was a typical joke. The renowned neurosurgeon and bioethicist covered his office walls with a big photo of himself and all sorts of honors, from frequent-flier awards to an honorary sergeant's badge from security at MetroHealth Medical Center. White died at home in Geneva Township after struggling with diabetes and prostate cancer. The outspoken doctor gained fame with scalpels, pens and microphones. He founded Metro's neurosurgery department. He achieved firsts such as isolating and transplanting mammal brains. He founded Pope John Paul II's Committee on Bioethics, belonged to the Pontifical Academy of Sciences and stumped for what he considered the right to life at all ages. He examined Vladimir Lenin's preserved brain, consulted with Boris Yelstin's doctors and joined the medical team treating John Paul II's critical injuries from gunshots. He debated champions of animal rights and withstood many protestors. He posed for GQ, wrote for Reader's Digest and many other periodicals, edited scholarly journals and published more than 700 papers. He was medical consultant for the movie "The X-Files: I Want to Believe." White said he read three books a day, mostly about history and religion. He smoked a pipe and usually skipped meals until supper. He performed more than 10,000 surgeries, some up to 18 hours long. He raised 10 children. He slept about five hours per night. Sam Miller, leader of Forest City Enterprises, said of White in 1988, "He could have gone into private practice and made an untold fortune. He traded wealth for goodness." On Thursday, Bishop Anthony Pilla, former head of the Cleveland Catholic diocese, called White "a brilliant mind, a world-respected surgeon and researcher, a person with a much-needed, keen sense of moral values and their impact on science and medicine." He said White helped shift devout people of many faiths from opposing extraordinary medicine to supporting it as pro-life. White went to Mass daily at Our Lady of Peace Catholic Church and prayed before surgery. He told Scene magazine, "I believe the brain tissue is the physical repository for the human soul." In one of many articles for The Plain Dealer, he wrote "A medical career will always offer the ultimate in human satisfaction by combining the scientific with the ministry." Dr. Maurice Albin, a neuroanesthesiologist formerly with Metro General, now with the University of Alabama, called White "a marvelous surgeon. He had wonderful intuitive instincts." A medical student once dropped a heavily loaded syringe that pierced White's shoe and toe. White said, "You're trying to kill the professor." Without removing the syringe, he kept operating. White loved to mingle and tease. With a reporter in tow, he called out two wisecracks in 1998 to the crowd on a hospital elevator. He said there were so many women on board, "they want to redecorate the elevator." Then he asked, "You did push six, the only good floor?" The floor was his, of course. He often called himself a poor Catholic boy. He was born in Duluth, Minn., in a working-class family and lost his father in the Pacific in World War II. Before the war ended, his son became an Army lab technician there. White graduated from the College of St. Thomas in Minneapolis, earned a medical degree at Harvard University and trained at the affiliated Brigham Hospital, where he met his future wife, Patricia Murray, a nurse. He spent six years at the Mayo Clinic, earning a Ph.D. in neurosurgery meanwhile at the University of Minnesota. Joining what was Cleveland Metropolitan General Hospital in 1961, he founded his department and a brain research laboratory.White pioneered what became widespread methods of draining fluids and chilling injured parts of the brain for surgery. He learned partly by experimenting on animals. He led the first transplants of brains from one dog to another and also one monkey to another. He became a leading target for protestors. One interrupted a banquet in his honor by offering him a bloody replica of a human head. Others called his house asking for "Dr. Butcher." When the surgeon testified in a civil hearing about Dr. Sam Sheppard's murder case, lawyer Terry Gilbert compared Dr. White to Dr. Frankenstein. White never backed down. He debated an animal-rights leader at the City Club and championed animal experiments in many talks and articles. He taught and co-chaired neurosurgery at Case Western Reserve University School of Medicine. He was a trustee of the City Club. He inspected hospitals in China and Russia and wrote about them. He helped the American College of Surgeons write protocols. His many awards included papal knighthoods, honorary doctorates, visiting professorships and the 1997 Humanitarian Award of the American Association of Neurological Surgeons. He was one of 85 doctors portrayed in the book "Modern Neurosurgical Giants." White lived in Cleveland Heights first and Shaker Heights for many years. He retired in 1998 and moved to Geneva's beachfront.

JOHN M. HOWARD, M.D.

HOWARD John M., MD John M. Howard, MD, of Toledo, Ohio, died peacefully Wednesday, March 17, 2011. He was 91 years old and a native of Alabama. He was a mentor, teacher, writer, distinguished colleague and researcher at the Department of Surgery at the University of Toledo. He visited 80 countries on all seven continents, often as a visiting professor, lecturer or surgical mentor. He was an avid gardener and birdwatcher. During the Korean War, Dr. Howard directed the U.S. Army's Surgical Research Team which pioneered the MASH unit for which he was awarded the Legion of Merit by order of President Dwight D Eisenhower. Dr. Howard and his late wife, Nina Abernathy Howard have six children, 10 grand children and six great-grandchildren. He is survived by Sarah Shepherd Rice Howard of Toledo, whom he married after Nina's death; his sister, Mary Louise Jones of Birmingham, Alabama, and his children, John Jr. (Patsy) of Houston, Texas, Robert F. of Galveston, Texas, Nina (Mick) Oakley of Penfield, NY, George (Eileen) of Columbus, Ohio, Susan Howard (Mark Weihs) of Perrysburg, OH, and Laura (Tim) Hickey of Toledo, Ohio.

JOHN BATDORF, M.D.



John Wesley Batdorf, Jr. M.D. passed away on Thursday, July 5, 2012, at his home in Redding, CA. He was born on August 3, 1926, the first of five children born to the Reverend John W. Batdorf Sr. and Dora L. (Gerig) Batdorf in Dallas, Texas. He is survived by his wife of 64 years Harriet V. (Bohling) Batdorf; his children: Janelle E. Ayers and husband Eric, Daniel K. Batdorf and wife Gail; Dr. Kristin J. Batdorf and husband Jose Rodriguez; and grandchildren: Megan Ayers, Jeremiah Batdorf, Kate Batdorf, Jacob Batdorf, and August Rodriguez. He is also survived by his brother Dr. Joseph T. Batdorf and wife Carol; his sister Elizabeth Royster and husband Dr. James Royster and sisters-in-law Beverly Batdorf; Helen Sumpter, Jeanette Derry, and Pearl Bohling; several cousins and numerous nieces and nephews. He was preceded in death by his parents, his brother David B. Batdorf and sister Mary Blevins. A service celebrating his life will be held at a later date in Anderson, Indiana. Dr. Batdorf graduated from Kalamazoo High School in Kalamazoo, Michigan in 1944. Later that summer he enlisted in the Navy where he was a pharmacist's mate third class. He received an honorable discharge in July 1946. That fall he began studies in pre-med at Anderson College in Anderson, Indiana. He met his future wife at a church camp in 1946. They were married on January 28, 1948 in Flint, Michigan. Dr. Batdorf studied at the University of Michigan for one year before entering Medical School at Wayne State University. Following graduation from medical school and an internship at Hurley Hospital in Flint, MI he was in general practice in Goodrich, MI for three years, making many house-calls and delivering many babies. He started a four year residency in general and trauma surgery at Hurley Hospital in 1957. He opened a surgical practice in Flint in 1961. In 1963, Dr. Batdorf moved to Las Vegas, Nevada, where he joined a surgical and trauma practice. He was a co-founder of the Trauma Symposium at Caesar's Palace in 1965, and continued as the director for many years. In 1967 he began developing a statewide plan for rural emergency services in Nevada. For several years, he traveled extensively throughout rural areas of Nevada teaching emergency caregivers and was an originator of PRIN: Professional Rescue Instructors of Nevada. In 1974 he received the Governor's Award for Comprehensive Statewide Emergency Services. He also received a Certificate for Humanitarian Service from the American Medical Association's Volunteer Physician to Vietnam program in 1966 for three months of volunteer service. Dr. Batdorf was chief of surgery and on the Board of Trustees of Southern Nevada Memorial Hospital from 1968 to 1972, and had multiple appointments at the University Medical Center in Las Vegas. He was a developer and chief of the Lion's Burn Center at UMC for many years. He helped develop and obtain certification for the surgical residency program at the University Medical School and was professor of surgery at the University of Nevada School of Medicine in Las Vegas from 1981. In 1987 he retired from private practice and was employed by the University Medical Center Trauma Clinics and Quick Care Facilities until 1995. In May of that year he was named Professor of Surgery Emeritus of the University of Nevada in Reno. Dr. Batdorf was a Fellow of the American College of Surgeons, a governor of the College 1980 to 1985, and a member of its Committee on Trauma. He was a founding member of the American Trauma Society and a member of several other surgical and trauma associations including the American Burn Association. He was a speaker at numerous trauma and surgical conventions and published numerous articles in medical journals. He received many awards and citations for his dedication to surgery. In his free time, he enjoyed fishing on Lake Mead and walking quietly in the woods near his cabins in northern Michigan. He loved sharing "the lake" with family and friends. Many of his nieces and nephews have fond memories of summers at the Big Long Lake. He enjoyed inviting friends and students to barbeques at the Roc-N-Doc Ranch in Pahrump, NV. In retirement he enjoyed keeping up with relatives, sharing philosophical conundrums with friends and jokes with acquaintances over the internet. He loved reading scientific journals, marveling about new discoveries in the universe, subatomic particles and the "string theory" which he was happy to explain to anyone who had the time and interest to listen. Because of his declining health, Dr. Batdorf and his wife moved to Redding, CA in 2009 to be close to two of their children. He continued to enjoy listening to music, listening to books on tape, watching the public television channel and learning about the world. He liked to go out to eat and he enjoyed a new restaurant with his wife and daughter less than one week before his death. He looked forward to long talks on the telephone with relatives and friends. Although he did not say much, he liked to hear what each one was doing. When able, he enjoyed going to church and appreciated visits from the minister and volunteers. He liked taking "walks" in the neighborhood and in the many beautiful parks in Redding, using a motorized chair that he liked to operate himself. We will miss him.

PAUL HODGSON, M.D.

James Edney, M.D., chief of surgical oncology at UNMC, first met Paul Hodgson, M.D., when Dr. Edney was a third-year medical student.

"Dr. Hodgson was the epitome of the consummate surgical educator," Dr. Edney said. "He was a true gentleman who lived his life to the highest principles, a meticulous surgeon who always put the interests of the patient in the forefront, and an outstanding mentor and role model for the surgical trainee."

Dr. Hodgson, the former chairman of the UNMC Department of Surgery, died Wednesday. He was 91.

After earning his medical degree in 1945 at the University of Michigan in Ann Arbor, Dr. Hodgson served as a captain in the U.S. Army Medical Corps from 1946-1948.

He returned to the University of Michigan and joined the faculty in the department of surgery before coming to UNMC in 1962 as professor of surgery. During his tenure, he served as assistant dean for academic affairs from 1969 to 1972 and chairman of the department of surgery from 1972 to 1984. He held an appointment as Shackleford Professor of Surgery and was named an honorary alumnus of the College of Medicine in 1985. He retired in 1988, becoming an emeritus professor of surgery.

"He truly cared about the university, the College of Medicine, the department of surgery, and he was especially fond of the residents," said David W. Mercer, M.D., current chairman of the department of surgery.

In 2006, Dr. Hodgson was named one of The Nebraska Medical Center's "Legends," an honor awarded to retired physicians who have demonstrated remarkable leadership, professionalism and friendship.

"He was clearly a superstar in surgical education and supported the department in that arena in so many ways, including the Paul Hodgson Lectureship that brought so many other superstars in surgery to the UNMC campus," Dr. Mercer said.

Jon Thompson, M.D., was recruited to UNMC 30 years ago by Dr. Hodgson. He now holds Dr. Hodgson's old post as the Shackleford Professor of Surgery.

"I was attracted more by the trust and confidence he inspired than the certainty of the opportunity," Dr. Thompson said. "He was warm and engaging, had strong values, and was genuinely interested in others.

"Dr. Hodgson was a superb surgeon who could perform almost any operation. His surgical skill, patience, attention to detail and caring manner endeared him to his patients. He influenced legions of medical students, surgical trainees, and fellow surgeons," Dr. Thompson said.

"UNMC has lost a strong supporter, the department of surgery has lost an important part of its history, and we have all lost a valued mentor and friend."

FREDERICK W. FULLER, M.D.

Dr. Frederick W. Fuller of Bellaire, Texas, died Wednesday, Jan. 22, 2014, after along illness. He was 86.

Dr. Fuller was born in St. Joseph, Mo., in 1927 and grew up in Albuquerque, N.M. He enlisted in the U.S. Navy during World War II and served on the U.S.S. Bairoko in the Pacific.

After the war, he attended the University of New Mexico and graduated from Stanford University. He then made his way East and attained his medical degree from Northwestern University in Chicago. He completed his surgical residency at New York Hospital-Cornell Medical Center in Manhattan, where he also met his wife, the late Cynthia Quayle Fuller. After marrying in 1962, Dr. and Mrs. Fuller moved to New Jersey, where they raised three children.

Dr. Fuller was the founder of the Burn Center at St. Barnabas Medical Center in Livingston, still New Jersey's only burn center.

In addition to his devotion to his family and his patients, Dr. Fuller was an avid history buff and music lover, and in his earlier years enjoyed fishing and golf.

He is survived by a sister, Hester Eastham of Albuquerque; three children, Hester Fuller of Boston; Julia Fallon and her husband, Michael B. Fallon, of Bellaire, and Rice Fuller and his wife, Lucia O'Sullivan, of New Brunswick, Canada, and four grandchildren, Sam, Charlie, Jack, and Madeline.

SAVE THE DATE

76TH ANNUAL MEETING
OF THE
AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA
AND
CLINICAL CONGRESS OF ACUTE CARE SURGERY

SEPTEMBER 13 -16

75th Annual Meeting of AAST and Clinical Congress of Acute Care Surgery
Waikoloa, HI September 14-17, 2016

TUE. 9/13/2016	FUNCTION	ROOM
2:00 PM – 7:00 PM	Registration	Grand Promenade
5:00 PM – 7:00 PM	Pediatric Pre-Session	Kohala Ballroom 3
WED. 9/14/2016	**FUNCTION**	**ROOM**
6:15 AM – 7:25 AM	Military Liaison Committee Meeting	Kona Ballroom 2-3
6:15 AM – 7:25 AM	Patient Assessment Committee Meeting	Kohala Ballroom 2
6:15 AM – 7:25 AM	Research & Education Fund Committee Meeting	Kona Ballroom 1
6:30 AM – 7:30 AM	Medical Student, Resident and In-Training Fellow Breakfast *(Ticketed Event)*	Kohala Ballroom 1
6:30 AM – 5:30 PM	Registration	Grand Promenade
7:00 AM – 8:30 AM	Breakfast	Grand Promenade
7:00 AM – 7:30 PM	Exhibits	Grand Promenade/Kona Foyer
7:30 AM – 7:50 AM	Welcome	Grand Ballroom
7:50 AM – 10:50 AM	Session I: Plenary Papers 1-9	Grand Ballroom
10:50 AM – 11:00 AM	Break	Grand Promenade
11:00 AM – 12:00 PM	Session II: Presidential Address, Grace S. Rozycki, MD. MBA	Grand Ballroom
12:00 PM – 1:15 PM	Lunch Sessions *(Ticketed Event)*	Various Locations
1:15 PM – 4:35 PM	Session IIIA: Papers 10-19	Grand Ballroom
1:15 PM – 4:35 PM	Session IIIB: Papers 20-29	Kona Ballroom 4-5
4:45 PM – 5:15 PM	Session IV: Master Surgeon Lecture, Frederick Moore, MD	Grand Ballroom
5:15 PM – 7:00 PM	Session V: Poster Session & Exhibit Hall Opening	Grand Promenade/Kona Foyer
6:30 PM – 8:30 PM	*Journal of Trauma & Acute Care Surgery* Editorial Meeting	Kohala Ballroom 1
THURS. 9/15/2016	**FUNCTION**	**ROOM**
6:15 AM – 7:30 AM	Acute Case Surgery Committee Meeting	Kona Ballroom 1
6:15 AM – 7:30 AM	Critical Care Committee Meeting	Kona Ballroom 2-3
6:15 AM – 7:30 AM	Disaster Ad Hoc Committee Meeting	Kohala Ballroom 1
6:15 AM – 7:30 AM	International Relations Committee Meeting	Kohala Ballroom 2
6:15 AM – 7:30 AM	Multi-Institutional Trials Committee Meeting	Kohala Ballroom 3
6:15 AM – 7:30 AM	Prevention Committee	Kohala Ballroom 4
6:15 AM – 7:30 AM	Reimbursement/Coding Committee	Kona Ballroom 4- 5
7:00 AM – 12:30 PM	Registration	Grand Promenade
7:00 AM – 1:00 PM	Exhibits and Posters	Grand Promenade/Kona Foyer
7:00 AM – 8:30 AM	Breakfast	Grand Promenade
7:30 AM – 9:00 AM	Session VI: Papers 30-39	Grand Ballroom
10:45 AM – 11:00 AM	Break	Grand Promenade/Kona Foyer
11:00 AM – 11:30 AM	Scholarship Presentations	Grand Ballroom
11:30 AM – 12:30 PM	Session VIII: Fitts Lecture: M. Margaret Knudson, M.D.	Grand Ballroom
1:00 PM – 4:00 PM	Optional Session: ANZAST/ATS Podium Paper Session	Kona Ballroom 4-5
FRI. 9/16/2016	**FUNCTION**	**ROOM**
6:15 AM – 7:30 AM	ACS Program Directors Meeting	Kona Ballroom 1
6:15 AM – 7:30 AM	Education/CME Committee Meeting	Kona Ballroom 2-3
6:15 AM – 7:30 AM	Geriatric Trauma Committee Meeting	Kohala Ballroom 2
6:15 AM – 7:30 AM	Pediatric Trauma Surgery Committee Meeting	Kohala Ballroom 3
6:15 AM – 7:30 AM	Publications and Communications Committee Meeting	Kohala Ballroom 4
6:30 AM – 7:30 AM	International Attendees Breakfast *(Ticketed Event)*	Kohala Ballroom 1
7:00 AM – 8:30 AM	Breakfast	Grand Promenade
7:00 AM – 1:30 PM	Exhibits and Posters	Grand Promenade/Kona Foyer
7:00 AM – 3:00 PM	Registration	Grand Promenade
7:30 AM – 10:30 AM	Session IX: Acute Care Surgery Papers 40-48	Grand Ballroom
10:30 AM – 11:45 AM	Session X: Panel: IOM Report on Military Civilian Collaboration	Grand Ballroom
11:45 PM – 1:00 PM	Lunch Sessions *(Ticketed Event)*	Various Locations
1:30 PM – 4:45 PM	Session XIA: Papers 49-59	Grand Ballroom
1:30 PM – 4:45 PM	Session XIB: Papers 60-70	Kona Ballroom 4-5
4:50 PM – 5:00 PM	Military Awards	Grand Ballroom
5:00 PM – 6:15 PM	AAST Annual Business Meeting	Grand Ballroom
6:30 PM – 10:45 PM	AAST Annual Banquet/ Luau	Palace Lawn *(weather permitting)*
SAT. 9/17/2016	**FUNCTION**	**ROOM**
7:00 AM – 8:00 AM	New Fellows Breakfast *(Ticketed Event)*	Kona Ballroom 2-3
7:00 AM – 10:00 AM	Registration *(If necessary)*	Grand Promenade
7:00 AM – 8:30 AM	Breakfast	Grand Promenade/Kona Foyer
8:00 AM – 9:18 AM	Session XII: Quick Shot Session I: Papers 1-13	Grand Ballroom
9:19 AM – 9:35 AM	Break	Grand Promenade/Kona Foyer
9:35 AM – 11:00 AM	Session XIII: Quick Shot Session II: Papers 14-26	Grand Ballroom
11:00 AM	Meeting Adjourned	

SPEAKER READY ROOM: Waikoloa 2
Tuesday, September 13th – 2:00 PM – 7:00 PM
Wednesday, September 14th – 6:15 AM – 5:00 PM
Thursday, September 15th – 6:15 AM – 12:00 PM
Friday, September 16th – 7:00 AM – 5:00 PM
Saturday, September 17th – 7:00 AM – 11:00 AM