

UNINTENDED EFFECTS OF AUTOMOTIVE INSURANCE POLICIES ON RETRIAGE OF SEVERELY INJURED PATIENTS

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Introduction: States maintain either no-fault or at-fault automotive insurance policies, with no-fault states having lower administrative barriers than at-fault states for clinical care reimbursement of motor vehicle collision injuries. However, it is unknown whether no-fault policies influence patterns in trauma care, including retriage, or same-day emergent transfer of injured patients to higher level care. Timely retriage reduces injury mortality similar to being taken directly to a high-level trauma center. Thus, our objective was to examine whether no-fault policies were associated with differences in retriage of severely injured patients.

Methods: We conducted a retrospective cross-sectional study of patients with severe (injury severity score >15) MVC injuries using the Healthcare Cost and Utilization Project State Emergency Department and Inpatient Databases for five states from 2016-2017. FL, MA, and NY are no-fault states, while MD and WI are at-fault states. Only Medicare patients were included to minimize confounding by other payers. The primary outcome was retriage, and secondary outcome was undertriage. Multivariable logistic regression was used to identify factors associated with both outcomes.

Results: A total of 2,110 patients from 251 hospitals were included. Median age was 70 years (interquartile range: 65-78), traumatic brain injury (35.6%) was most common, and median ISS was 25 (IQR: 17-33). Unadjusted rates of retriage were 2.6% in no-fault states and 9.3% in at-fault states ($p < 0.001$). After adjusting for age, sex, race/ethnicity, ISS, Elixhauser, injury, hospital trauma volume, and state, no-fault states were associated with lower odds of retriage (adjusted odds ratio: 0.50, 95% confidence interval: 0.27-0.94) and higher odds of undertriage (aOR: 3.2, 95% CI: 2.2-4.7).

Conclusion: No-fault automotive insurance policies, compared to at-fault policies, were associated with less retriage and more undertriage of patients on Medicare with severe MVC injuries. Further study can better characterize how financial incentives may influence practice patterns for trauma and acute care.

NATIONAL STUDY OF TELETRAUMA USE IN US EMERGENCY DEPARTMENTS

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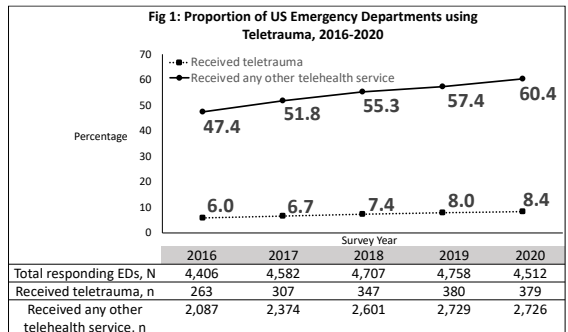
Introduction: Nearly 30 million rural Americans lack timely access to trauma care expertise available at level I/II trauma. Telehealth is an established approach to improve access to healthcare expertise using remote consultation. However, the use of telehealth in trauma (teletrauma) across the US is not known. We describe the prevalence, trends, and factors associated with teletrauma use and adoption among US emergency departments (EDs).

Methods: Data from the National Emergency Department Inventory (NEDI-USA) 2016-2020 were analyzed. NEDI-USA is a nationwide survey of all non-federal/non-specialty US EDs. The proportion of EDs using teletrauma vs any other telehealth service by year was calculated.

Multivariable logistic regression was used to describe factors associated with teletrauma use in 2020 and with adoption between 2016-2020.

Results: Among 4,512 EDs with available survey data in 2020 (82% response rate), 379 (8%) reported receiving teletrauma vs 2,726 (60%) receiving any other telehealth service (Fig 1). Teletrauma use ranged between 0% (AL, CT, DC, IN, NJ, NV, OK, OR, RI, SC) to >60% (AR 61% SD 76%, ND 86%). Factors associated with teletrauma use included rural location [odds ratio (95% CI); 2.44 (1.77-3.36)], critical access hospital (CAH) [2.67 (1.83-3.88)] and basic stroke hospital [1.74 (1.32-2.30) vs non-stroke hospital] designations. Factors associated with adoption of teletrauma by 2020 included CAH [1.98(1.35-2.90)] and basic stroke hospital [1.42(1.04-1.94) vs non-stroke hospital] designation.

Conclusion: Teletrauma lags significantly behind other telehealth services in US EDs. We encourage more research on how teletrauma is being used and barriers to its wider implementation.



ANALYSIS OF PUBLICATION RATES OF PRESENTATIONS AT AMERICAN TRAUMA/ACUTE CARE SURGERY CONFERENCES

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Introduction: Trauma/acute care surgery research is presented at four major, annual American conferences: American Association for the Surgery of Trauma (AAST), Eastern Association for the Surgery of Trauma (EAST), Western Trauma Association (WTA), and Pediatric Trauma Society (PTS). We hypothesized that oral/quick shot presentations are published at higher rates than posters, and that publications committees are associated with increased publication rates.

Methods: Conference programs from 2015-2019 were included. Web searches for title, authors, and content determined publication status and citation volume.

Results: A total of 2356 presentations were included, with 1849 (78%) articles published in 166 journals, including 778 (33%) in Journal of Trauma and Acute Care Surgery (JTACS), the official publication of all associations. Presentations from WTA (78%) and EAST (74%) were published at higher rates than AAST (64%) and PTS (47%) ($p < 0.001$). Overall, oral/quick shot presentations were published at higher rates (68% vs 32%, $p < 0.001$) and in JTACS (84% vs 50%, $p < 0.001$), but there was no difference in the impact factor (IF) of publishing journals or papers manuscripts compared to poster presentations. Published oral/quick shot manuscripts from AAST did have a higher IFs compared to posters, and those from EAST went to higher impact journals. Associations with publications committees (EAST and WTA) had highest publication rate overall and in JTACS. While posters are published at lower rates, the eventual impact of a published manuscript presented as a poster is equivalent to that of an oral/quick shot.

Conclusion: Most research presented at trauma conferences is published, with oral/quick shot presentations published at higher rates compared to posters. Publication committees may have value for selecting high-value research and increasing publication rates.

	AAST (1159)			EAST (438)			WTA (219)	PTS (540)		
	Orals & Qs (466)	Posters (693)	P value	Orals & Qs (321)	Posters (117)	P value	Orals (219)	Orals & Qs (348)	Posters (192)	P value
Published, N (%)	396 (85%)	346 (50%)	<0.001	250 (78%)	75 (66%)	<0.001	169 (77%)	348 (55%)	59 (31%)	<0.001
Published in JTACS, N (%)	281 (71%)	95 (28%)	<0.001	186 (74%)	23 (30%)	<0.001	147 (87%)	192 (22%)	4 (7%)	0.009
Years to Publication	1.35 ± 0.83	1.71 ± 1.04	<0.001	0.45 ± 0.80	1.13 ± 1.25	<0.001	0.28 ± 0.57	1.81 ± 1.24	1.61 ± 1.27	0.275
Publishing Journal IF	3.61 ± 1.56	3.69 ± 9.88	0.877	3.64 ± 1.82	2.89 ± 1.52	0.003	3.56 ± 0.82	3.78 ± 13.51	2.61 ± 1.41	0.54
3 year Manuscript IF	6.10 ± 7.48	4.49 ± 12.75	0.033	4.47 ± 4.78	3.52 ± 3.93	0.154	4.76 ± 4.10	2.44 ± 3.05	2.31 ± 2.68	0.376

2015-2019 publication rates for orals and quick shots (QS) combined vs. poster presentations by meeting. Presented as mean ± standard deviation unless noted.

SURGICAL TREATMENT OF COMBINED PELVIC INJURIES USING MATHEMATICAL AND COMPUTER MODELING

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Introduction: The search for new approaches to providing medical care to victims with severe combined pelvic injuries (CPI) using modern diagnostic methods and minimally invasive surgery is scientific and practical interest. The purpose was to refine the treatment results based on the analysis of the CPI structure, the use of optimal approaches to the choice of surgery, using modern hemostasis methods and minimally invasive internal fixation of pelvic ring, taking into biomechanical modeling.

Methods: We analyzed the frequency and structure of CPI in the level I trauma center for 10 years. A comparative analysis of the victims who underwent pelvic packing or angioembolization was carried out. The relationship between the retroperitoneal hematomas parameters and the blood loss volume in various types of pelvic injuries was studied. Simulation was carried out using the ANSYS 16.1 system. To determine the outcome with high accuracy, predictive logit models were created. A new treatment and diagnostic algorithm for severe CPI and a method for choosing the optimal internal pelvic fixation have been developed. The immediate and long-term results were analyzed.

Results: Most often, CPI were after traffic accidents (55.9%) and falling (37.3%). 84.7% of victims were young people. ISS > 25 was in 1/2 of the victims. CPI was characterized by shock (55.2%) and significant blood loss volume (56.3%). In the analysis the pelvic hematoma volumes were: in moderate blood loss - $178.3 \pm 17.1 \text{ cm}^3$, in severe - $331.6 \pm 24.4 \text{ cm}^3$, extremely severe - $461.3 \pm 68.5 \text{ cm}^3$; among the victims with extravasation on CT - $517.5 [250; 835] \text{ cm}^3$. A positive correlation was found between the blood loss volume and pelvic hemorrhage volume and prevalence. The choice of the surgical hemostasis method depends on the hemodynamics, the bleeding nature and other injuries. The developed algorithm allowed achieving optimal outcome in 79.4% cases. Analysis of thromboelastography allowed correcting the transfusion therapy. Biomechanical modeling of pelvic injuries allowed choosing the optimal method of minimally invasive fixation (MIF) in the first 12 hours. MIF allowed stabilization in 81.7%. The developed predictive logit-models made it possible to determine the outcome and apply MIF safely.

Conclusion: The developed algorithm allowed to reduce the total (from 13.5 to 20.5%) and 24-hours mortality rate (from 5.3 to 10.6%) and complications (from 51.4 to 34.5%).

DISTAL NEPHRON ROLE IN LETHAL CRUSH SYNDROME HYPERKALEMIA MAY HAVE TREATMENT IMPLICATIONS

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Introduction: Crush Syndrome causes loss of glomerular filtration rate (GFR) and lethal hyperkalemia. In austere environments, dialysis and intensive care may be unavailable. However, since potassium (K) is secreted by the distal nephron, excretion is not directly dependent on GFR and GFR-supporting therapy. Thus, investigation of the role of the distal nephron in crush syndrome hyperkalemia could yield life-saving intervention.

Methods: 23 female swine were anesthetized, subjected to sham surgery (n=5) or bilateral captive bolt blast injury (n=18) and randomized to treatment 30 minutes later with the proximal tubule protectant cilastatin sodium, cilastatin and calcitriol, or vehicle (untreated group). Blood and urine samples were obtained immediately before treatment (0 hour) and at 2 hours. 6-hour GFR was measured using iohexol clearance. Urine/plasma sodium (Na) and K were determined by flame photometry. Urine and plasma osmolality were quantified. K clearance, fractional excretion, and trans-tubular gradient were calculated. Analysis was completed in R.

Results: Plasma K did not change in shams (n=5, p=0.7). In injured, untreated animals (n=7), plasma K increased (p=0.03), accompanied by reduced K clearance (p=0.01) and creatinine clearance (p=0.03). Urine Na was high and was unchanged over time (p>0.05). There was no difference in the fractional excretion of K (p=0.67) between 0 and 2 hours, while the trans-tubular K gradient (TTKG) decreased (p=0.05). K clearance covaried with 2-hour creatinine clearance (p<0.001), but not with 6-hour GFR (p-value=0.28). Treated animals did not have significantly different K clearance at 2 hours compared to the untreated group (p>0.05).

Conclusion: Crush syndrome caused hyperkalemia accompanied by reduced K clearance which was not changed by cilastatin treatment. Together these data suggest that K excretion in early crush syndrome is decoupled from GFR and proximal tubule injury. Further mechanistic study may yield novel physiologic interventions in lethal hyperkalemia, potentially altering trauma and disaster care.

A COST-UTILITY ANALYSIS OF LAPAROSCOPIC SUBTOTAL CHOLECYSTECTOMY

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Introduction: Safe laparoscopic cholecystectomy requires obtaining a critical view, however in difficult dissections, accomplishing this view can sometimes be unsafe. There is no consensus for the optimal “damage control” strategy when unable to obtain a critical view safely. Several studies have compared the cost-effectiveness of open versus laparoscopic cholecystectomies, but none have compared reconstituted laparoscopic subtotal cholecystectomy (R-LSC) to fenestrated laparoscopic subtotal cholecystectomy (F-LSC). The complications such as bile leak and need for endoscopic retrograde cholangiopancreatography (ERCP) associated with R-LSC, must be weighed against complications of recurrent percutaneous interventions and completion cholecystectomy in F-LSC, while evaluating the cost associated with each procedure. We hypothesize that R-LSC is the more cost-effective strategy.

Methods: We performed a decision-analytic model using TreeAge software to evaluate the cost-effectiveness of a F-LSC versus R-LSC. Our base case was a patient with acute cholecystitis undergoing a LSC. Costs, probability, and Quality-Adjusted Life Years (QALYs) were generated from published literature.

Results: R-LSC was cost-effective at \$7755 and 0.89 QALY compared to F-LSC at \$7969 and 0.88 QALY. Deterministic analysis identified the probability of a bile leak and cost of ERCP as the most impactful variables in the study. One-way sensitivity analyses demonstrated that F-LSC becomes the cost-effective option over R-LSC when the probability of bile leak decreases to 7% from 18% or when the cost of an ERCP decreases to \$642 from \$8000.

Conclusion: R-LSC is more cost-effective with improved health utility compared to F-LSC. In R-LCS, the decreased prevalence of bile leak and decreased need for ERCP outweigh the increased need for multiple percutaneous interventions in F-LCS.

AN ESTIMATED BLOOD VOLUME-BASED ENOXAPARIN DOSING PROTOCOL IMPROVES VENOUS THROMBOEMBOLISM PROPHYLAXIS IN EMERGENCY GENERAL SURGERY PATIENTS

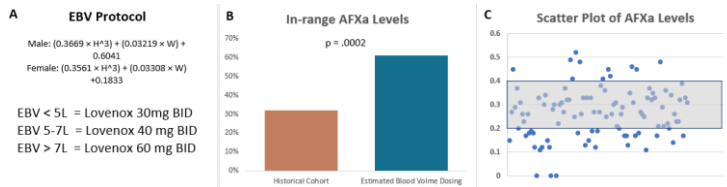
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Introduction: Fixed-dose enoxaparin regimens do not provide adequate Xa inhibition in many surgical populations, and low Anti Factor Xa (AFXa) levels are associated with venous thromboembolism. We aimed to assess an individualized, estimated blood volume (EBV) based enoxaparin dosing protocol on AFXa levels in emergency general surgery (EGS) patients.

Methods: We performed a prospective observational trial of EGS patients admitted to an urban tertiary center. Adult patients without end-stage renal disease and who were otherwise eligible for VTE prophylaxis with enoxaparin were dosed with an EBV-based protocol (Fig 1A). The primary outcome was peak AFXa level obtained 2.5-6hrs at enoxaparin steady state. Accepted AFXa range was 0.2-0.4 IU/mL. Dose adjustment and AFXa re-evaluation was performed when appropriate. Secondary outcomes included bleeding and VTE events. The prospective cohort was compared to a historical cohort of EGS patients dosed with a fixed, BMI-based protocol.

Results: 100 consecutive patients with properly timed, steady state AFXa levels were included in the study. The majority of patients were female (55%), the mean age was 57 years, and the most common admission diagnosis was small bowel obstruction (23%). A total of 62% of patients required an operation. Initial AFXa was in-range in 61% of patients on EBV dosing and was significantly more likely to be in-range compared to the historical BMI-based cohort (Fig 1B, 1C, $p = .0002$). There were four patients who required a blood transfusion. Two of those patients had AFXa levels above 0.4. There were no VTE events on index admission.

Conclusion: An EBV-based enoxaparin dosing protocol improves VTE prophylaxis in EGS patients by increasing rates of in-range initial Anti Factor Xa levels.



CREATION OF A MULTIDISCIPLINARY INPATIENT COMPLEX PROCEDURAL TEAM MAY IMPROVE HOSPITAL EFFICIENCY

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Introduction: Hospitals struggle to perform routine but complex inpatient procedures in a cost-effective, timely and high-quality manner. Limited examples exist of procedural teams created to perform technically complex procedures. We created a multidisciplinary 'Inpatient Procedural Team' (IPT) to meet the demand of non-vascular, non-enteral access bedside procedures and studied its impact on hospital efficiency.

Methods: IPT was comprised of APP's and sonographers with medical direction from an acute care surgeon, and expert collaboration with other specialties. IPT worked collaboratively with interventional radiology for scheduling of bedside procedures under sonographic guidance. IPT scope of practice included thoracentesis (T), paracentesis (P) and lumbar punctures (LP). We performed a before/after study evaluating consult completion time, case creation to procedure start time, and nursing hours saved.

Result: In five months, IPT performed 1036 procedures, averaging 7.6 ± 0.34 cases per day: 575 P, 466 T (17 including chest tubes) and 30 LP. Complication rates for P = 0.17%, T = 0.21%, LP and chest tube = 0%. We found a 69.2% decrease in consult completion time (9.75hrs vs 3hrs, $p < 0.0001$), a 79.3% decrease in case-creation-to-procedure start time (13.92hrs vs 2.88hrs, $p < 0.0001$). When compared to pre-IPT data, procedures were completed a mean 17.8hrs earlier than historic controls. 350 off-floor nursing hours were saved and 2000 patient transports to radiology and back were eliminated.

Conclusion: The IPT has shown to positively impact time to procedure, off floor nursing time, and patient transports while providing safe, high-quality care. Working collaboratively with IR, acute care surgery can assist APP's with bedside procedures to improve hospital efficiency.

FACTORS ASSOCIATED WITH THE NEED FOR LONG-TERM TOTAL PARENTERAL NUTRITION IN SURVIVORS OF ACUTE SUPERIOR MESENTERIC ARTERY OCCLUSION

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Introduction: Acute superior mesenteric artery (SMA) occlusion is an uncommon condition associated with high mortality. If extensive bowel resection is performed for patients with acute SMA occlusion and the patient survives, long-term total parenteral nutrition (TPN) may be needed due to short bowel syndrome. This study examined factors associated with the need for long-term TPN after the treatment of acute SMA occlusion.

Methods: We retrospectively analyzed 78 patients with acute SMA occlusion. Patients were abstracted from a Japanese database from institutions with at least 10 patients with acute SMA occlusive disease from January 2015 through December 2020

Results: Among the initial cohort there were 41/78 survivors. Of these, 14/41 (34%) required permanent TPN who were compared with those who did not require long-term TPN (27/41, 66%). Compared to patients in the non-TPN group, those in the TPN group had significantly shorter remaining small intestine (90.7 cm vs. 218 cm, $P<0.01$), more patients with time from onset to intervention >6 hours ($P=0.02$), pneumatosis intestinalis on enhanced computed tomography scan ($P=0.04$), ascites (Odds Ratio 11.6, $P<0.01$), and a positive smaller superior mesenteric vein sign ($P=0.03$). These were considered significant risk factors for needing long-term TPN. Age, gender, underlying disease, presence of peritoneal sign, presence of shock requiring vasopressors, site of obstruction (proximal vs. distal), and initial treatment (surgery vs. interventional radiology vs. thrombolytic therapy) were not significantly different between the two groups. Long-term TPN was significantly associated with longer hospital stay (52 vs. 35 days, $P=0.04$). Multivariate analysis identified the presence of ascites as an independent risk factor for needing long-term TPN.

Conclusion: The need for permanent TPN after treatment of acute SMA occlusion is significantly associated with longer hospital stay, longer time to intervention, and characteristic imaging findings (pneumatosis intestinalis, ascites, Smaller SMV sign). Ascites is an independent risk factor.

PERIOPERATIVE OUTCOMES OF SUPER- AND SUPER-SUPER OBESE PATIENTS WITH NECROTIZING SOFT TISSUE INFECTIONS

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Introduction: Necrotizing soft tissue infections (NSTI) are commonly encountered by the acute care surgeon, often in obese patients. However, little is known about the risk profiles of Class III obesity patients, specifically in the morbidly obese (MO, BMI \geq 40-49.9), super-obese (SO, BMI \geq 50-59.9), and super-super obese (SSO, BMI \geq 60) patients with NSTI. The aim of this study is to investigate the perioperative outcomes of MO, SO, and SSO patients undergoing intervention for NSTI.

Methods: The National Surgical Quality Improvement Program database was queried for patients aged 18-90 years with BMI \geq 40 undergoing surgery for NSTI from 2011-2021 based on ICD codes for gas gangrene, necrotizing fasciitis, and Fournier's gangrene. Patients were stratified into MO, SO, and SSO categories. The primary and secondary outcomes were 30-days postoperative mortality and morbidities. Descriptive statistics and multivariable logistic regression were performed.

Results: A total of 1,999 patients were included: 1,236 MO (61.8%), 489 SO (24.5%), and 274 SSO (13.7%). Average 30-day mortality for the MO, SO, and SSO cohorts were 8.6%, 6.5%, and 13.5% respectively ($p=0.005$). In multivariable analysis, both SO and SSO groups had higher odds of suffering from septic shock compared to MO patients (OR 1.42, 95%CI 1.05-1.9, $p=0.021$; and OR 1.66, 95%CI 1.15-2.41, $p=0.007$, respectively), and the odds of 30-day mortality for patients with NSTI was nearly doubled in the SSO group compared to MO cohort (OR 1.93, 95%CI 1.13-3.31, $p=0.016$).

Conclusion: We found that SO and SSO patients undergoing surgery for NSTI had different risk profiles compared to MO patients. Both SO and SSO patients had higher likelihood of developing postoperative septic shock, and the SSO group was also noted to have significantly higher odds of 30-days mortality compared to MO patients. These findings support the need for further stratification amongst Class III obesity patients undergoing surgical intervention for NSTI.