FORTY-FIRST ANNUAL MEETING

Big Sky, Montana 2011

Western Trauma Association

February 27 – March 4, 2011

Big Sky, Montana

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Benjamin Zarzaur	X	
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Thomas Scalea	X	
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41st Annual Meeting
Big Sky, Montana
2010-2011

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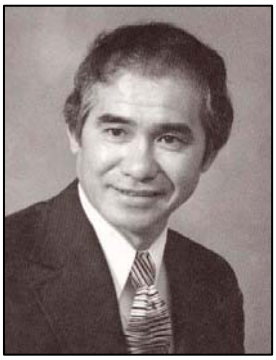
Earl G. Young, M.D.
(1928-1989)



RESIDENT PAPER COMPETITION

Dr. Earl G. Young of Minneapolis was a founding member of the Western Trauma Association and its 14th President. He died of a myocardial infarction, Monday, February 27, 1989, while skiing at Snowbird during the 19th Annual Meeting of the Association.

Dr. Young received his medical degree from the University of Rochester, N.Y. and Ph.D. in surgery from the University of Minnesota. He completed advanced training in cancer research at Harvard, a fellowship in cardiovascular surgery at Baylor University in Houston and studied microvascular surgery at the University of California–San Diego.

He was a clinical professor of surgery at the University of Minnesota Medical School, and a practicing general and vascular surgeon at the Park-Nicollet Clinic in Minneapolis from 1960. He was nationally known and was actively involved in research and education throughout his career. In 1988, one year before his untimely death, he received the Owen H. Wangensteen Award for Academic Excellence from the University of Minnesota Health Science Center. It was awarded by an unprecedented unanimous vote of all 72 surgical residents.

The Residents Paper competition was begun in 1991 as a tribute to Dr. Young's memory and his "spirit of inquiry, love of learning … and commitment in service to mankind."* The award is given to the best resident paper presented at the Annual Meeting.

- Dr. John Najarian characterizing Earl at a memorial service in his honor at the University of Minnesota.

EARL G. YOUNG AWARD RECIPIENTS

Resident	Institution	Year
Joseph Schmoker, MD	University of Vermont	1991
Joseph Schmoker, MD	University of Vermont	1992
Charles Mock, MD	University of Washington	1993
Gino Travisani, MD	University of Vermont	1994
Phillip C. Ridings, MD	Medical College of Virginia	1995
David Han, MD	Emory University	1996
Preston R. Miller, MD	Wake Forest University	1997
Geoffrey Manley, MD, PhD	University of California-San Francisco	1998
James M. Doty, MD	Medical College of Virginia	1999
D.J. Ciesla, MD	Denver Health Medical Center	2000
Ricardo J. Gonzales, MD	Denver Health Medical Center	2001
Scott C. Brakenridge	Cook County Hospital	2002
Adena J, Osband, MD	UMDNJ-New Jersey Medical School	2003
Cindy Lee, MD	UMDNJ-New Jersey Medical School	2004
Ernest A. Gonzalez, MD	University 0f Texas at Houston	2005
Jennifer M. Watters, MD	Oregon Health & Science University	2005
Jennifer J. Wan, MD	University of California-San Francisco	2006
Jennifer J. Wan, MD	University of California-San Francisco	2007
Keir J. Warner, MD	University of Washington	2008
T. W. Constantini, MD	University of California-San Diego	2009
C. Anne Morrison, MD	Baylor College of Medicine	2010

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IN MEMORIUM

Earl G. Young, MD
February 27, 1989

Gerald S. Gussack
August 25, 1997

Peter Mucha, Jr.
August 9, 2006

W. Bishop McGill
October 2007

“Paint the Ceiling” Lectureship

G. Jerry Jurkovich, M.D.	1997	Snowbird, Utah
John W. McGill, M.D.	1998	Chateau Lake Louise, Alberta
William T. Close, M.D.	1999	Crested Butte, Colorado
Jimmy Cornell	2000	Squaw Valley, California
Geoff Tabin, M.D.	2001	Big Sky, Montana
James H. “Red” Duke, M.D.	2002	Chateau Whistler, British Columbia
David V. Shatz, M.D.	2003	Snowbird, Utah
Susan and Tim Baker	2004	Steamboat Springs, Colorado
Alex Habel, M.D.	2005	Jackson Hole, Wyoming
Andrew Schneider	2006	Big Sky, Montana
Ernest E. Moore, M.D.	2007	Steamboat Springs, Colorado
Pamela Kallsen	2008	Squaw Valley, California
Sylvia Campbell, M.D.	2009	Crested Butte, Colorado
William Schecter, M.D.	2010	Telluride, Colorado
Jeff McKenney, M.D.	2011	Big Sky, Montana

Founders' Basic Science Lecturers

Raul Coimbra, M.D.	2009	Crested Butte, Colorado
Lawrence Diebel, M.D.	2010	Telluride, Colorado
Carl Hauser, M.D.	2011	Big Sky, Montana

WESTERN TRAUMA ASSOCIATION
Schedule of Events
February 27 – March 4, 2011

Sunday, February 27		**Room**
4:30pm – 7:30pm	Registration	Outside Huntley Dining Room
5:00pm – 7:00pm	Welcome Reception	Huntley Dining Room
5:00pm – 7:00pm	Children's Reception	North Huntley Dining Room
7:00pm – 9:00pm	Past President's Meeting	Shoshone Boardroom
Monday, February 28		
6:30am – 9:00am	WTA Registration Open	Gallatin/Madison Foyer
6:30am – 9:00am	Exhibits Open	Lake/Canyon
6:30am – 8:00am	Attendee Breakfast	Lake/Canyon
7:00am – 9:00am	Scientific Session 1	Gallatin/Madison
7:30am – 9:00am	Friends & Family Breakfast	Peaks Restaurant
3:30pm – 5:00pm	Afternoon Break	Lake/Canyon
3:30pm – 6:00pm	WTA Registration Open	Gallatin/Madison Foyer
3:30pm – 6:00pm	Exhibits Open	Lake/Canyon
4:00pm – 6:00pm	Scientific Session 2	Gallatin/Madison
6:00pm – 8:00pm	WTA Board Meeting	Shoshone Boardroom
Tuesday, March 1		
6:30am – 9:00am	WTA Registration Open	Gallatin/Madison Foyer
6:30am – 9:00am	Exhibits Open	Lake/Canyon
6:30am – 8:00am	Attendee Breakfast	Lake/Canyon
7:00am – 9:00am	Scientific Session 3	Gallatin/Madison
7:30am – 9:00 am	Friends & Family Breakfast	Peaks Restaurant
10:00am – 12:00pm	WTA Ski Race	Chet's Knob
12:00pm – 1:30pm	Mountain BBQ	Huntley Dining Room
3:30pm – 5:00pm	Afternoon Break	Lake/Canyon
3:30pm – 6:00pm	WTA Registration Open	Gallatin/Madison Foyer
3:30pm – 6:00pm	Exhibits Open	Lake/Canyon
4:00pm – 6:00pm	Scientific Session 4 & Presidential Address	Gallatin/Madison
6:00pm – 7:00pm	Multi-Center Trials	Gallatin/Madison
Wednesday, March 2		
6:30am – 9:00am	WTA Registration Open	Gallatin/Madison Foyer
6:30am – 9:00am	Exhibits Open	Lake/Canyon
6:30am – 8:00am	Attendee Breakfast	Lake/Canyon
7:00am – 9:00am	Scientific Session 5	Gallatin/Madison
7:30am – 9:00am	Friends & Family Breakfast	Peaks Restaurant
3:30pm – 5:00pm	Afternoon Break	Lake/Canyon
3:30pm – 6:00pm	WTA Registration Open	Gallatin/Madison Foyer
3:30pm – 6:00pm	Exhibits Open	Lake/Canyon
4:00pm – 6:00pm	Book Club	Village Center Lobby
4:00pm – 4:10pm	Scientific Session 6	Gallatin/Madison
4:10pm – 5:00pm	Paint the Ceiling Lecture	Gallatin/Madison
5:00pm – 6:00pm	Business Meeting	Gallatin/Madison

Thursday, March 3

6:30am – 9:00am	WTA Registration Open	Gallatin/Madison Foyer
6:30am – 9:00am	Exhibits Open	Lake/Canyon
6:30am – 8:00am	Attendee Breakfast	Lake/Canyon
7:00am – 9:00am	Scientific Session 7	Gallatin/Madison
7:30am – 9:00am	Friends & Family Breakfast	Peaks Restaurant
3:30pm – 5:00pm	Afternoon Break	Lake/Canyon
3:30pm – 6:00pm	WTA Registration Open	Gallatin/Madison
3:30pm – 6:00pm	Exhibits Open	Lake/Canyon
4:00pm – 6:00pm	Scientific Session 8	Gallatin/Madison
7:00pm – 10:00pm	Banquet	Huntley Dining Room
7:00pm – 10:00pm	Children's Party	TBD

Friday, March 4

6:30am – 9:00am	WTA Registration Open	Gallatin/Madison Foyer
6:30am – 9:00am	Exhibits Open	Lake/Canyon
6:30am – 8:00am	Attendee Breakfast	Lake/Canyon
7:00am – 9:00am	Scientific Session 9	Gallatin/Madison
7:30am – 9:00am	Friends & Family Breakfast	Peaks Restaurant
3:30pm – 6:00pm	Registration Open	Gallatin/ Madison Foyer
3:30pm – 5:00pm	Afternoon Break	Lake/Canyon
4:00pm – 6:00pm	Scientific Session	Gallatin/Madison

PROGRAM

Scientific Session 1
Monday AM, February 28, 2011
Moderator: M. Gage Ochsner, MD
Location: Gallatin / Madison Foyer

Paper	Time	Title/Authors	Page
	7:00AM	**Welcome to the 41st Annual Meeting of the WTA** M. Gage Ochsner President, WTA 2011	
1	7:20 AM	**Non Illegitimi Carborundum Est – Tale of a Skiing Safety Pioneer** Christopher Baker	28
2	7:30 AM	***Beneficial Effects of Histone Deacetylase Inhibition and Hydrogen Sulfide with Severe Hemorrhage and Ischemia-Reperfusion Injury** M Causey, S Miller, A Beekley, Z Hoffer, J Stallings, M Martin	30
3	7:50 AM	**Quickclot on the Brain?** H Schiller, L Hughes, S Mund	32
4	8:00 AM	**Validating the WTA Algorithm for Managing Patients with Anterior Abdominal Stab Wounds: A WTA Multicenter Trial** W Biffl, CC Burlew, EE Moore, SE Rowell, TN Pham, J Elterman, GJ Jurkovich	34
5	8:20 AM	***Aged Plasma Transfusion Increases Mortality in Rat Model of Uncontrolled Hemorrhage** P Letourneau , M McManus, K Sowards, W Wang, S Pati, N Matijevic, C Wade, J Holcomb	36
6	8:40 AM	***Volume Expansion with Hetastarch in Trauma Patients Requiring Emergency Surgery** M Ryan, MP Ogilvie, JC Gomez-Rodriguez, BMT Pereira, EJ Pierre, AS Livingstone, MG McKenney, KG Proctor	38

*** Earl Young Competition**

Scientific Session 2
Monday PM, February 28, 2011
Moderator: John Holcomb, MD
Location: Gallatin / Madison Foyer

Paper	Time	Title/Authors	Page
7	4:00 PM	***The Future of Acute Care Surgery: A Perspective from the Next Generation** H Moore, P Moore, A Grant, T Song, L Kornblith, M Knudson, T Tello, B Zuckerbraun, A Sauaia, E Moore	40
8	4:20 PM	***Elevated Blood Pressure After Trauma Increases Risk for Delayed Pneumonia and Death** M Singer, M Clond, J Mirocha, M Bukur, C Brown, D Margulies, A Salim, E Ley	42
9	4:40 PM	***Changes in Massive Transfusion Resuscitation Over Time: An Early Shift in the Right Direction?** B Kautza, M Cohen, E Moore, J Cuschieri, M West, J Minei, R Maier, T,Billiar, A Peitzman, J Sperry	44
	5:00 PM	**Critical Decisions in Trauma** Moderator: Robert McIntyre	46-50
		Mangled Extremity Thomas Scalea, M.D.	
		Evaluation and Management of Peripheral Vascular Injury – Part 2 David V. Feliciano, M.D.	
	6:00 PM	**Board of Directors Meeting**	

*** Earl Young Competition**

Scientific Session 3
Tuesday AM, March 1, 2011
Moderator: Doreen Dipasquale, MD
Location: Gallatin / Madison Foyer

Paper	Time	Title/Authors	Page
10	7:00 AM	**Management and Outcome of Casualties with Bilateral Lower Extremity Amputations During the War in Afghanistan** C Fox, C Rodriguez, C White, A Groth, E Cox, M Schreiber	52
11	7:20 AM	***Determination of Efficacy of Novel Modified Chitosan Sponge Dressing in a Lethal Arterial Injury Model in Swine** G De Castro, M Kilbourne, M Dowling, S Raghavan, K Keledjian, I Driscoll, J Hess, T Scalea, G Bochicchio	54
12	7:40 AM	***Intermittent Versus Continuous Gastric Enteral Nutrition in Critically Ill Trauma Patients: A Prospective Randomized Trial** M Wood, P Beery, E Wooten, U Pandya, J Solomon, K Marable, J Opalek, J Jenkins, K Suh	56
13	8:00 AM	**Split Down the Middle: A Functional Survivor of Complete Traumatic Hemipelvectomy** B Thomas, B Dart, R Maxwell	58
14	8:10 AM	***Impact of a Defined Management Algorithm on Outcome Following Traumatic Pancreatic Injury** J Sharpe, LJ Magnotti, JA Weinberg, SM Stickley, BL Zarzaur, TC Fabian, MA Croce	60
	8:30 AM	**Point : Counterpoint I** **Endovascular Repair of Traumatic Aortic Transections: Ready for Prime Time?** Riyad Karmy-Jones and Steve Shackford	62

*** Earl Young Competition**

Scientific Session 4
Tuesday PM, March 1, 2011
Moderator: Thomas Scalea, MD
Location: Gallatin / Madison Foyer

Paper	Time	Title/Authors	Page
15	4:00 PM	***Finding the Sweet Spot: Identification of Optimal Glucose Levels in Critically Injured Patients** M Pepper, ME Kutcher, D Morabito, D Sunjaya, MM Knudson, MJ Cohen	64
16	4:20 PM	***The Natural Progression of Intracranial Hemorrhage and Neurosurgical Intervention in the Trauma Population** D Koehler, J Shipman, O Gunter, R Miller, O Guillamondegui	66
17	4:40 PM	***Functional Outcomes Following Blunt Cerebrovascular Injuries** J DiCocco, T Fabian, K Emmett, B Zarzaur, M Croce	68
	5:00 PM	**Presidential Address** M. Gage Ochsner The Surgeon's Role in Patient Safety: Past, Present and Future	70

*** Earl Young Competition**

Scientific Session 5
Wednesday AM, March 2, 2011
Moderator: Ben Zarzaur, MD
Location: Gallatin / Madison Foyer

*** Earl Young Competition**

Scientific Session 6
Wednesday PM, March 2, 2011
Moderator: Nick Namias, MD
Location: Gallatin / Madison Foyer

Paper	Time	Title/Authors	Page
23	4:00 PM	**Natural History of Minimal Aortic Injury After Blunt Trauma: Selective Nonoperative Management Is Safe** J Paul, T Neideen, S Tutton, D Milia, P Tolat, W Foley, K Brasel	84
	4:10 PM	**Paint the Ceiling Lecture: Je Le Pansay** Jefferson McKenney	86
	5:00 PM	**Business Meeting**	

Scientific Session 7
Thursday AM, March 3, 2011
Moderator: Robert Maxwell, MD
Location: Gallatin / Madison Foyer

Scientific Session 8
Thursday PM, March 3, 2011
Moderator: Rick Miller, MD
Location: Gallatin / Madison Foyer

Paper	Time	Title/Authors	Page
29	4:00 PM	**The Relationship of Obesity and Complications Post-Trauma in High Energy Pelvic and Acetabular Fractures** J Richards, B Morris, O Guillamondegui, K Sweeney, W Obremskey, P Kregor	100
30	4:20 PM	**A Direct Comparison of Helicopter Vs. Ground Transportation of Injured Trauma Patients** W Bromberg, M Busken, M Hamilton, E Bonner, E Meister, MG Ochsner	102
31	4:40 PM	**Optimal Positioning for Emergent Needle Thoracostomy: A Cadaver Based Study** K Inaba, BC Branco, M Eckstein, DV Shatz, DJ Green, TT Noguchi, D Demetriades	104
	5:00 PM	**Panel of Experts** Moderator: R. Stephen Smith Panel: M. Gage Ochsner, John Holcomb, Tom Scalea, Robert Maxwell	106

Scientific Session 9
Friday AM, March 4, 2011
Moderator: Charles Fox, MD
Location: Gallatin / Madison Foyer

Scientific Session 10
Friday PM, March 4, 2011
Moderator: R. Stephen Smith, MD
Location: Gallatin / Madison Foyer

ABSTRACTS

NON ILLEGITIMI CARBORUNDUM EST--TALE OF A SKIING SAFETY PIONEER

Christopher C. Baker
Carilion Clinic

Presenter: Christopher Baker **Senior Sponsor: Christopher Baker**

The Western Trauma Association held its first meeting at Vail in 1971, and it has always been dedicated to quality scientific presentations, a love of skiing, and a high priority on fun and family time.

I wish to pay tribute to my father, William J. Baker, MD, (1915-1993) who made substantial contributions to the treatment of ski injuries in New England. Bill Baker received a BA from Harvard College (1936) and a Masters in Psychology from Tufts (1938) before receiving his MD degree from Harvard (1942). After a surgical internship at the MGH, he served with the Marines in the Pacific and came home with a Purple Heart and the Silver Star. On completing his training at the West Roxbury VA in 1950, he practiced in Laconia, NH, for 30 years.

An active member of the community, Dr. Baker was committed to safety and injury prevention and was instrumental in pushing for seat belt legislation and motorcycle helmet laws. Although he did not start skiing until the age of 35, it was true love at first sight for him. It is in this area that the parallel exists between my father and Western Trauma. Early on in his skiing career, Bill became a member of the local ski patrol. Soon thereafter he was appointed to a five-man commission to refurbish the local ski area (Gunstock)--a post held for 15 years.

Concerned about the inconsistent care of the injured skier in New England, my father teamed with 8 other surgeons from NH and VT (including Bish McGill, later a member of WTA) and held an organizational meeting at the Balsams Resort in Dixville Notch, NH in 9/57. They founded the Northeast Medical Association (NEMA), committed to the prevention of and improved care of ski injuries. The inaugural meeting has held at Stowe in 2/58. Having been skiing since the age of 3, I felt truly privileged to attend this event at the age of 10. I attended several NEMA meetings with my parents, before becoming a full-fledged member in 1984. My Dad continued to be an active member of NEMA until hip problems sidelined him in 1988.

Although NEMA has a number of parallels with WTA, one difference is that NEMA rotated their meetings between the Northeast, the West, and Europe. William Baker was one of a small group of visionary New England surgeons who saw a need and filled it. I am forever grateful to him as a father and as a mentor who shared his love of skiing and surgery with me.

BENEFICIAL EFFECTS OF HISTONE DEACETYLASE INHIBITION AND HYDROGEN SULFIDE WITH SEVERE HEMORRHAGE AND ISCHEMIA-REPERFUSION INJURY

M, Causey; S, Miller; A, Beekley; Z, Hoffer; J, Stallings; M, Martin
Madigan Army Medical Center

Presenter: Marlin W. Causey **Senior Sponsor: Matthew Martin**

Background: Valproic acid (VPA) is a histone deacetylase inhibitor that may decrease cellular metabolic needs following traumatic injury. Hydrogen sulfide (HS) is compound thought to induce hibernation states within mammals. We hypothesized that VPA and/or HS may have beneficial effects in preventing or reducing the cellular and metabolic sequelae of ischemia-reperfusion (IR) injury.

Methods: 42 Yorkshire swine underwent 35% blood volume hemorrhage, followed by a lethal truncal IR injury and six hours of resuscitation. Physiologic and laboratory parameters were closely measured and the pigs divided into 6 groups: sham, control, VPA dosing before cross clamp (VPA-B), VPA dosing after cross clamp (VPA-A), HS after cross clamp (HS), and HS and VPA given after cross clamp (HSVPA).

Results: All animals developed significant coagulopathy, acidosis, and anemia. Animals receiving VPA-A, HS, and HSVPA had decreased acidosis and coagulopathy as measured by pH ($p=0.02$, 0.004, 0.05) and INR ($p=0.01$, 0.01, 0.04). VPA-A, HS, and HSVPA pigs had a decreased requirement for crystalloid ($p=0.01$, <0.01, 0.07) and epinephrine (all <0.01) during resuscitation. Hemoglobin, hematocrit, fibrinogen, and electrolytes were not different among the groups. Pathologic analysis performed by two independent pathologist (inter rater reliability 0.83, $p<0.01$) demonstrated decreased injury with H2S and VPA administration.

Conclusions: Both valproic acid and hydrogen sulfide conferred a significant cardiovascular, metabolic, and pathologic protective effect when given prior to reperfusion in a severe IR injury model.

QUICKCLOT ON THE BRAIN?

H Schiller, L Hughes, S Mund
Mayo Clinic, Rochester, MN

Presenter: Henry Schiller **Senior Sponsor: Henry Schiller**

Objective: Providing neurosurgical care in an austere environment without access to CT scan or a trained neurosurgeon is problematic for the general surgeon. This difficulty is compounded when life-threatening intracranial hemorrhage uncontrollable by conventional hemostatic techniques is encountered in the course of debridement of penetrating head wounds. We sought to describe our experience using intracranial QuickClot to salvage such a patient.

Methods: Individual case review with photographs and video.

Results: A 26 year old male presented to a limited medical facility with a GCS of 13 due to a penetrating head injury and suffered rapid neurologic deterioration. As neither CT scan, nor neurosurgeon was available, the attending general surgeon proceeded with debridement of head wound in a desperate attempt to salvage the patient. Debridement was performed as described in The Emergency War Surgery NATO Handbook (2nd US Revision) but was complicated by life-threatening intraoperative bleeding which could not be controlled with electrocautery, suture ligation, thrombin/Gelfoam or gauze packing. Despite the known highly exothermic reaction, QuickClot beads were placed intracranially within the wound track as a desperation maneuver. This effectively controlled bleeding and the patient survived with a postoperative GCS of 15. By 2 months postoperatively the patient had shown further neurologic recovery, but the QuickClot was noted to have largely migrated from its intracranial position into the subcutaneous space. It was subsequently evacuated without difficulty

Conclusion: The intracranial use of QuickClot, successfully salvaged a patient with life-threatening intracranial bleeding when all conventional methods had failed. Despite concerns regarding the known highly exothermic reaction associated with QuickClot, the patient had an acceptable neurologic outcome.

VALIDATING THE WTA ALGORITHM FOR MANAGING PATIENTS WITH ANTERIOR ABDOMINAL STAB WOUNDS: A WTA MULTICENTER TRIAL

W Biffl, CC Burlew, EE Moore, SE Rowell, TN Pham, J Elterman, GJ Jurkovich
Denver Health Medical Center, WTA Multicenter Trials Group

Presenter: Walter Biffl **Senior Sponsor: Walter Biffl**

The optimal management of stable patients with anterior abdominal stab wounds (AASWs) has been a matter of debate. A recent WTA multicenter trial found that exclusion of peritoneal penetration by local wound exploration (LWE) allowed immediate discharge (DC) of 41% of pts who did not have immediate indications for laparotomy (LAP). Performance of CT scanning (CT) or diagnostic peritoneal lavage (DPL) did not improve the DC rate; in fact, these tests led to nontherapeutic LAP (NTL) in 24 and 31% of cases, respectively. A proposed new algorithm recommended LWE, with DC if LWE (-), and admission for serial clinical assessments (SCA) if LWE (+), without further testing. The purpose of this study was to determine the safety and efficacy of this approach.

Methods: An IRB-approved study enrolled patients with AASWs at WTA institutions, managed per the WTA protocol. Patients with shock, evisceration, or peritonitis were taken for immediate LAP. Stable patients underwent LWE and were to be managed per protocol, and taken for LAP as their condition warranted (eg, for bleeding or peritonitis). Data on the clinical course were recorded prospectively.

Results: 142 pts (88% male, age 33±3) were enrolled. 37 (26%) had immediate LAP for evisceration (19), shock (13), peritonitis (3) or impaled knife (2); 3 (8%) died and median LOS was 6 days. Of the remaining 105 patients, 31 were taken to the OR based on test results, contrary to protocol; their NTL rate was 45% (see Table). 74 patients were managed per protocol. 9 were DC'ed after (-) LWE. 65 were admitted for SCA, of whom 10 were taken for LAP at 5.4±2.2 hrs. Median LOS was 3.5 days, and there was no morbidity. 4 (3 with peritonitis, 1 wound bleeding) had NTL.

Indication for LAP (n)	NTL
Immediate LAP indication (37)	4 (11%)
(+) LWE (21)	10 (48%)
(+) DPL (6)	3 (50%)
(+) CT (3)	1 (33%)
(+) FAST (1)	0 (0%)

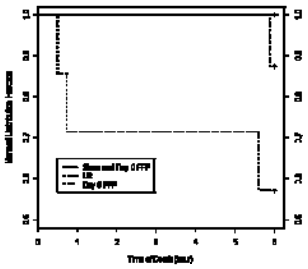
Conclusions: Despite implementation of the WTA algorithm, NTL remains problematic. These data reinforce that (+) LWE does not correlate with the need for LAP, and that CT and DPL continue to lead to high rates of NTL. Patients can be managed safely by SCA, without any discernible morbidity or excess LOS. In patients without indications for immediate LAP, LWE followed by either DC or admission for SCA offers the potential to minimize hospital admission and LOS, as well as NTL rates. These data validate the previous WTA study and the proposed algorithm for managing patients with AASWs.

AGED PLASMA TRANSFUSION INCREASES MORTALITY IN A RAT MODEL OF UNCONTROLLED HEMORRHAGE

P Letourneau, M McManus, K Sowards, W Wang, S Pati, N Matijevic, C Wade, J Holcomb
University of Texas Medical School at Houston, Department of Surgery Center for Translational Injury Research

Presenter: Phillip Letourneau **Senior Sponsor: John Holcomb**

Introduction: Recent data has associated improved survival after hemorrhagic shock with the early and increased use of plasma. Some centers have placed thawed plasma (stored for up to 5 days, FFP5) in the ED, facilitating its early use. Our lab has shown increased endothelial permeability, apoptosis and inflammation, with decreased endothelial migration, thrombin burst and platelet microparticles in FFP5 compared to freshly thawed plasma (FFP0). The potential clinical effects of these changes have not been demonstrated. We hypothesized that FFP5 would increase mortality and bleeding compared to FFP0 in a rodent model of uncontrolled liver hemorrhage.
Methods: Rats (male, 240-365g) were anesthetized and underwent pre-injury isovolemic hemodilution of 15% of calculated blood volume with the two human plasma groups (FFP0 and FFP5) and two controls (sham and lactated Ringers, LR). A reproducible liver injury was created by excising a portion of liver (range 0.3 – 0.45% total body weight), resulting in uncontrolled hemorrhage. Rats that lived for 30 minutes after liver injury were resuscitated to their baseline blood pressure with Hextend® and followed for 6 hours or death. Blood pressure and heart rate were monitored throughout the experiments. Coagulation was assessed by thromboelastography (TEG). Primary outcomes were survival, intraperitoneal blood volume, and changes in coagulation status. Statistical analysis was performed by the Fisher's exact test, log-rank test, and one way ANOVA where appropriate.
Results: Data are summarized in the table. In the FFP5 group overall survival was 54%, compared to 100% in the FFP0 and sham group (p=0.03). Rats that received FFP5 demonstrated decreased overall survival compared to all other groups (p=0.04, Figure 1). For animals that survived 30 minutes and were resuscitated, there was no difference in bleeding and or coagulopathy amongst the groups. There were no differences in intraperitoneal blood volume between the 4 groups (p=0.26, ANOVA). Irrespective of treatment, animals that died following resuscitation demonstrated increased intraperitoneal blood volume (77±11% total blood volume vs. 37±1.9%; p<0.001). TEG data demonstrated no differences other than a decrease in clot strength (MA) at 30 minutes in the LR group compared to control (data not shown).
Conclusion: In this model of mild pre-injury hemodilution with plasma, rats that received FFP5 had decreased survival after uncontrolled hemorrhage from hepatic injury. Interestingly, there were no differences in coagulation function between the two plasma groups. It is widely assumed that increases in survival associated with transfusion of FFP are related to changes in the coagulation profile. However, in this study we demonstrated a survival effect without changes in coagulation parameters. It is possible that changes in aged plasma, not related to coagulation, may be responsible for the increased mortality associated with FFP5 in this model. Considering our previous *in vitro* work and these new *in vivo* data, we have planned clinical studies that address these questions amongst trauma patients.



VOLUME EXPANSION WITH HETASTARCH IN TRAUMA PATIENTS REQUIRING EMERGENCY SURGERY

ML Ryan, MP Ogilvie, JC Gomez-Rodriguez, BMT Pereira, EJ Pierre, AS Livingstone, MG McKenney, KG Proctor
University of Miami Miller School of Medicine

Presenter: Mark L. Ryan **Senior Sponsor: Kenneth G. Proctor**

We have previously reported that hetastarch (HET, Hextend™, www.hospira.com) plus standard of care (SOC=intravenous fluids, blood, and blood products) during initial resuscitation was associated with reduced mortality and no obvious coagulopathy in 1714 trauma patients. This study tests the hypothesis that HET+SOC are more effective than SOC alone for volume expansion in critically injured patients who required an urgent operation.

Methods: From July 2009 to April 2010, we prospectively evaluated 194 trauma patients (70% penetrating; ISS=23±2; mortality 16%) who required urgent surgery; 77 received SOC and 117 received SOC as well as a maximum of 1.5L HET in the resuscitation bay (n=69) and/or the operating room n=48) of a level 1 trauma center at surgeon discretion.

Results: In patients who had suffered a penetrating injury and received HET+SOC, blood and blood product requirements were reduced and urine output was greater, indicating fluid expansion and restoration of volume (see table). Age, gender, and ISS (19) were equivalent in both groups. HET (<1.5L) was also associated with a significant fall in platelets (-52.5 for SOC vs. -105.4, p<0.001) without alteration of other coagulation parameters, suggesting dosing may be critical.

Penetrating Injury	HR	Hct	UOP (OR)	UOP (24hr)	PRBC (24 hr)	FFP (24 hr)	Mortality	Pressors
SOC (n=50)	94	32	648	2487	1805	3591	14%	24%
SOC+HET (n=87)	106	28	852	3124	1621	1477	7%	12%
p value	0.013	0.001	0.05	0.026	0.033	0.049	0.14	0.087

HR=Initial heart rate on presentation; Hct=Initial Hematocrit in OR; UOP=Urine Output (in OR and at 24h); PRBCs=blood transfused over 24h; FFP=plasma transfused over 24h

Conclusions: A randomized control trial is necessary, but these results further support the decision of the US Army to deploy HET for combat casualty care. In hemodynamically unstable patients with penetrating injury, HET seems to provide safe and effective volume restoration that is a salvage bridge to the next level of definitive critical care.

THE FUTURE OF ACUTE CARE SURGERY: A PERSPECTIVE FROM THE NEXT GENERATION

H Moore, PMoore, A Grant, T Song, L Kornblith, M Knudson, T Tello, B Zuckerbraun, A Sauaia, E Moore
University of Vermont, University of Pittsburgh, University of Colorado, University of California San Francisco

Presenter: H Moore **Senior Sponsor: E Moore**

Background: Access to emergent surgical care has been identified as a crises in the US. To address this challenge, the AAST has developed a fellowship in Acute Care Surgery (ACS) to reestablish broad-based surgical capabilities, but the viability of this new discipline will rest on the interests of the next generation of surgeons. The objective of this study was to determine key factors influencing the choice of surgical specialties among medical students with a focus on their interest in trauma/ACS.
Methods: An online questionnaire was distributed to medical students at four Western Trauma Association affiliated level I trauma centers, one of which also has an ACS fellowship. The survey was distributed to medical students at all levels (1st through 4th year). Students with an interest in surgery as a career were asked to complete the survey and rank factors and experiences influencing career selection on a scale of 1 (no influence) to 10 (critical). Students were also asked to rank their top five surgical specialties.
Results: 337 students interested in surgery responded. Mean age was 26 ± 0.2 yrs (range 20-37), 58% were male and 86% were single. Respondents were distributed evenly over medical schools and medical school years. The three most popular career choices were orthopedics (16%), trauma/ACS (12%) and pediatric surgery (8%). As students progressed through medical school, lifestyle factors such as predictable hours and family time became more important in influencing their career choice. Overall 115 students (34%) selected emergent surgery (trauma/ACS) as one of their top three career choices. Factors that were ranked significantly higher by students interested in trauma/ACS surgery were related to professional satisfaction (see below). These students also placed less emphasis on lifestyle factors when choosing a surgical career.
Conclusion: Our results indicate that there is a reassuring interest to address the growing demand for emergency surgery amongst current medical students exposed to a broad range of trauma/ACS patients in level 1 trauma centers. The trauma/ACS model is in accordance with the drives of these students looking for a diverse and challenging profession.

Categories	Students interested in Trauma/ACS N=115 Mean scores	Other surgical careers N=222 Mean scores	P Value
Intellectual Challenge	8.5	8.0	0.001
Lifesaving Intervention	8.1	7.4	0.002
Technical Demand	7.7	7.4	0.04
Practice Diversity	7.8	7.3	0.04

ELEVATED BLOOD PRESSURE AFTER TRAUMA INCREASES RISK FOR DELAYED PNEUMONIA AND DEATH

M Singer, M Clond, J Mirocha, M Bukur, C Brown, D Margulies, A Salim, E Ley
Cedars-Sinai Medical Center

Presenter: Matthew Singer **Senior Sponsor: Carlos Brown**

INTRODUCTION: Avoiding hypotension is a primary focus after trauma; little attention is paid to elevated systolic blood pressure (SBP). The purpose of this study is to determine the association between elevated SBP and outcomes in trauma patients.
METHODS: The Los Angeles County Trauma System Database was queried for all patients with blunt injuries who survived for at least two days following admission, between 2003 and 2008. Demographics and outcomes (pneumonia, mortality) were compared at various admission SBP subgroups (≥160, ≥170, ≥180, ≥190, ≥200, ≥210, ≥220). Patients with moderate to severe traumatic brain injury (TBI), defined as head abbreviated injury score (AIS) ≥ 3, were then identified and compared using multivariable logistic regression.
RESULTS: Data accessed from 14,382 trauma admissions identified 2,601 patients with moderate to severe TBI (TBI group) and 11,781 without moderate to severe TBI (non TBI group). Higher SBP was associated with increased risk for pneumonia and mortality in both TBI and non-TBI patients (Table). For all trauma patients, the adjusted odd ratio (AOR) for morality increased significantly for SBP ≥160mmHg (AOR 1.48, CI 1.15-1.90, p=0.003) and SBP <90mmHg (AOR 2.81, CI 1.90-4.15, P<0.0001). SBP ≥160mmHg increased the AOR for pneumonia (AOR 1.79, CI 1.30-2.46, p<0.001) and mortality (AOR 1.59, CI 1.10-2.29, p=0.01) in TBI patients. Similarly, SBP ≥160mmHg was associated with a trend in increased pneumonia (AOR 1.28 CI 0.97-1.69 p=0.078) and mortality (AOR 1.33 CI 0.94-1.91, p=0.11) in non TBI patients.
CONCLUSIONS: In blunt trauma patients who survive ≥ 2days, elevated admission SBP was associated with pneumonia and mortality. Our findings suggest that treating elevated SBP, especially in TBI patients, is important in to improve outcome. Further research is needed to assess the impact of treating elevated SBP following trauma.

Elevated admission SBP affects mortality in TBI and non TBI patients who survive longer than 24 hours

	TBI Patients (N = 2601)		Non-TBI Patients (N = 11781)	
SBP mmHg	Mortality	RR [95% CI]	Mortality	RR [95% CI]
≥ 160	12.6% (56/445)	2.10 [1.56–2.83]	3.6% (55/1538)	2.11 [1.56–2.84]
≥ 170	14.0% (39/278)	2.23 [1.60–3.11]	4.6% (41/887)	2.68 [1.92–3.73]
≥ 180	16.8% (29/173)	2.61 [1.81–3.76]	5.6% (30/536)	3.16 [2.18–4.60]
≥ 190	19.8% (22/111)	3.03 [2.02–4.53]	6.1% (19/314)	3.30 [2.09–5.21]
≥ 200	31.5% (17/54)	4.77 [3.14–7.26]	7.6% (13/170)	4.11 [2.40–7.05]
≥ 210	31.4% (11/35)	4.63 [2.78–7.72]	8.7% (9/103)	4.64 [2.45–8.78]
≥ 220	33.3% (7/21)	4.83 [2.60–8.99]	15.4% (8/52)	8.17 [4.26–15.65]

CHANGES IN MASSIVE TRANSFUSION RESUSCITATION OVER TIME: AN EARLY SHIFT IN THE RIGHT DIRECTION?

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University of Pittsburgh

Presenter: Benjamin Kautza **Senior Sponsor: Jason Sperry**

Objective: Increasing evidence suggests that high plasma:red blood cell (FFP:PRBC) and platelet:red blood cell (PLT:PRBC) transfusion ratios may prevent or reduce the morbidity associated with early coagulopathy which complicates massive transfusion (MT). To demonstrate how this evidence has impacted clinical practice, we sought to characterize changes in resuscitation which have occurred over time in a cohort of severely injured patients requiring MT.

Methods: Data were obtained from a multicenter prospective cohort study evaluating outcomes in blunt injured adults with hemorrhagic shock. MT was defined as requiring ≥ 10u PRBCs within 24hrs post-injury. Mean PRBC, FFP and PLT requirements (per unit, 6hr, 12hrs and 24hrs) were determined. SUB-MT, those patients just below the threshold for MT, were defined as requiring ≥ 7 and < 10u PRBC's in initial 24hrs. The % of resuscitation given at 6hrs relative to 24hrs total (6/24%) was determined for each transfusion component to determine if earlier, more aggressive resuscitation was occurring. Changes in MT% and transfusion ratios over time (2004-09) were analyzed by ANOVA. The 6/24% was compared across EARLY (admission prior to 1/07) and RECENT (after 1/07) periods for each component.

Results: Over the study time period (2004-09) for the MT group (n=527), ISS, initial base deficit and presenting INR were unchanged. No significant differences were found over time for 6hr, 12hr or 24hr FFP:PRBC and PLT:PRBC transfusion ratios in MT patients (Fig 1) despite a significantly lower mortality over time (p=0.01, data not shown). The % of patients who required MT overall did significantly (**) decrease over time (Fig 2.) SUB-MT patients (n=344) had significantly higher 6hr FFP:PRBC ratios and significantly higher 6hr,12hr and 24hr PLT:PRBC ratios in the RECENT time period. The 6/24% total for FFP and PLT transfusion was significantly (*) greater in the RECENT time period. (FFP 54% vs.70%, p=0.004, PLT 46% vs. 61%, p=0.048, Fig 3) No difference in the PRBC 6/24% was found.

Conclusion: In a severely injured cohort requiring MT, FFP:PRBC and PLT:PRBC ratios have not changed over time, while mortality and the rate of MT overall have significantly decreased. During the RECENT time period (2007-09) significantly higher transfusion ratios and a greater % of 6hr/24hr FFP and PLT were found in SUB-MT group, those patients just below the PRBC threshold definition of MT. These RECENT period changes correspond to the expanding literature on hemostatic resuscitation. This data suggests early, more aggressive attainment of high transfusions ratios may reduce the requirement for MT, may shift overall blood requirements below those which currently define MT, and may be associated with reduced mortality. Further prospective evidence is required to verify these findings.

Fig 1.

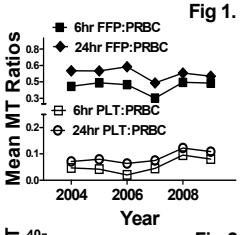


Fig 2.

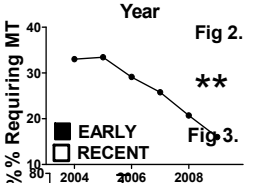
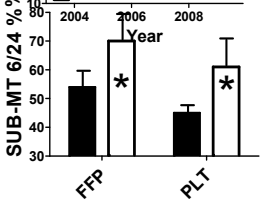


Fig 3.

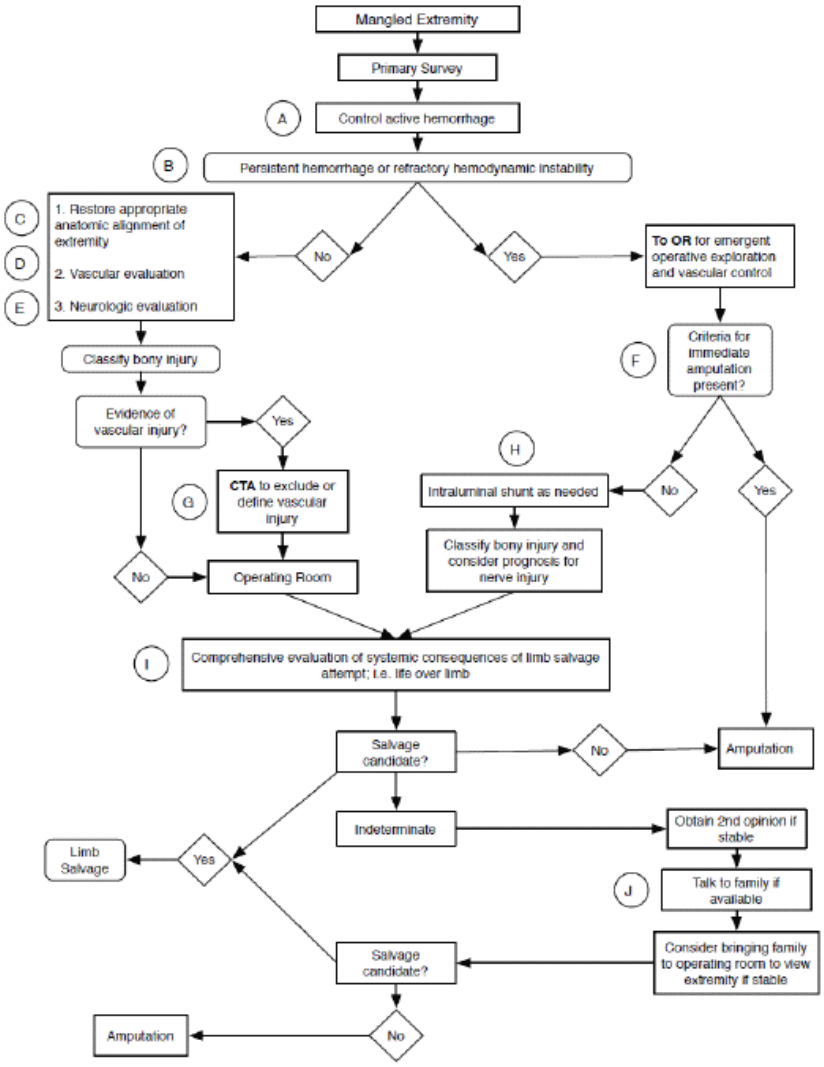


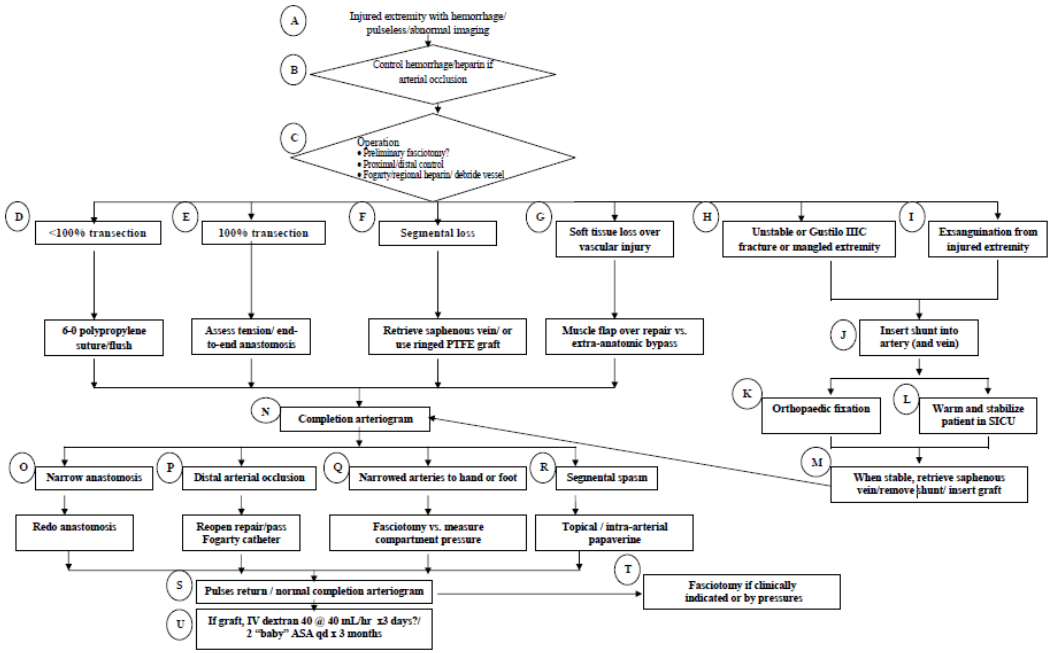
Critical Decisions in Trauma

Moderator: Robert McIntyre

Mangled Extremity
Thomas Scalea, M.D.

Evaluation and Management of Peripheral Vascular Injury – Part 2
David V. Feliciano, M.D.


Mangled Extremity
Primary Survey
A
Control active hemorrhage
B
Persistent hemorrhage or refractory hemodynamic instability
C
D
E
1. Restore appropriate anatomic alignment of extremity
2. Vascular evaluation
3. Neurologic evaluation
No
Yes
To OR for emergent operative exploration and vascular control
F
Criteria for immediate amputation present?
Classify bony injury
Evidence of vascular injury?
Yes
G
CTA to exclude or define vascular injury
H
Intraluminal shunt as needed
No
Yes
No
Operating Room
Classify bony injury and consider prognosis for nerve injury
I
Comprehensive evaluation of systemic consequences of limb salvage attempt; i.e. life over limb
Salvage candidate?
No
Amputation
Indeterminate
Obtain 2nd opinion if stable
Limb Salvage
Yes
J
Talk to family if available
Salvage candidate?
Consider bringing family to operating room to view extremity if stable
Amputation
No


A
Injured extremity with hemorrhage/ pulseless/abnormal imaging
B
Control hemorrhage/heparin if arterial occlusion
C
Operation
• Preliminary fasciotomy?
• Proximal/distal control
• Fogarty/regional heparin/ debride vessel
D
<100% transection
E
100% transection
F
Segmental loss
G
Soft tissue loss over vascular injury
H
Unstable or Gustilo IIIC fracture or mangled extremity
I
Exsanguination from injured extremity
6-0 polypropylene suture/flush
Assess tension/ end-to-end anastomosis
Retrieve saphenous vein/ or use ringed PTFE graft
Muscle flap over repair vs. extra-anatomic bypass
J
Insert shunt into artery (and vein)
K
Orthopaedic fixation
L
Warm and stabilize patient in SICU
N
Completion arteriogram
M
When stable, retrieve saphenous vein/remove shunt/ insert graft
O
Narrow anastomosis
P
Distal arterial occlusion
Q
Narrowed arteries to hand or foot
R
Segmental spasm
Redo anastomosis
Reopen repair/pass Fogarty catheter
Fasciotomy vs. measure compartment pressure
Topical / intra-arterial papaverine
S
Pulses return / normal completion arteriogram
T
Fasciotomy if clinically indicated or by pressures
U
If graft, IV dextran 40 @ 40 mL/hr x3 days?/ 2 "baby" ASA qd x 3 months

MANAGEMENT AND OUTCOME OF CASUALTIES WITH BILATERAL LOWER EXTREMITY AMPUTATIONS DURING THE WAR IN AFGHANISTAN

C Fox, C Rodriguez, C White, A Groth, E Cox, M Schreiber
Walter Reed National Military Medical Center, Bethesda, MD United States Army Institute of Surgical Research, Ft Sam Houston, TX Orthopaedic Surgery Service, Tripler Army Medical Center, Honolulu, HI

Presenter: Charles Fox **Senior Sponsor: Charles Fox**

Introduction: Hemorrhage from non-compressible vessels remains a significant cause of potentially preventable death in combat. Traumatic amputations can result in proximal wounds that require advanced skills in both tourniquet application and surgical maneuvers to minimize continued blood loss. The degree of shock and transfusion requirements for bilateral amputees in modern combat has not been reported. The objective of this report is to describe effective resuscitative and surgical management strategies by level of amputation (transfemoral vs. transtibial). This knowledge may improve survival for severely wounded casualties with major limb loss and is essential for resource allocation and medical operations planning.
Methods: We performed a retrospective analysis of the management and early outcome of all combat casualties presenting with a bilateral lower extremity traumatic amputation to the Role 3 military surgical hospitals (Bastion or Dwyer) in Southwest Afghanistan from 1 October 2009 to 30 September 2010. Data included demographics, injury mechanism, tourniquet use, admission and post resuscitation physiology, transfusion requirements, damage control maneuvers, techniques for vascular control, operative time, and survival.
Results: Forty-three male casualties (19, US; 24 UK) median age 24 (range, 19-37 years), were injured by blasts and divided into bilateral transfemoral (8, 19%), transfemoral-transtibial (18, 42%) and bilateral transtibial (17, 39%) groups (groups 1-3 respectively). Pre-hospital tourniquets (43, 100%) and blood administration during pre-hospital evacuation by the British medical emergency response team (26, 60%) was common. Median (range) presenting systolic blood pressure [90/65 (55-175/ 20-95], heart rate [131, 45-180] and temperature [35.2, 29.1-37.7] were consistent with hemorrhagic shock and acidosis [pH 7.14 (6.59-7.42), base deficit 11.5 (1-28)] and were normalized during the 3.12 ± 1.91 hour operation. Three (7%) presented in cardiac arrest and 5 (12%) required a resuscitative thoracotomy with aortic cross clamping. Perineal injuries (21, 49%) and pelvic fractures (7, 16%) influenced the method of proximal vascular control (transabdominal or retroperitoneal iliac clamping or pneumatic tourniquet ± groin dissection). Twenty-four hour median transfusion requirements (groups I, II, III) were 36, 27 and 22 units of blood, and 27, 25, 22 units of plasma respectively with 38 (88%) receiving a massive transfusion (>10 units/24 hrs). The definitive amputation level in 27 (63%) casualties was a bilateral transfemoral amputation. All transtibial amputees (group 3) survived. The overall survival rate was 93% (40/43) and is less likely for bilateral transfemoral amputees (group 1, $p<0.05$).
Conclusion: The present study is the first to report a strategy for treating shock and controlling hemorrhage among casualties with bilateral lower extremity traumatic amputations. A transfemoral amputation may require adjunctive proximal control maneuvers and have higher mortality; however the presenting physiologic derangements and transfusion requirements are considerable in all subgroups. The surgical outcomes associated with this approach may refine guidelines for hemorrhage control and blood utilization in the initial management of combat casualties with traumatic bilateral lower extremity amputation.

DETERMINATION OF EFFICACY OF NOVEL MODIFIED CHITOSAN SPONGE DRESSING IN A LETHAL ARTERIAL INJURY MODEL IN SWINE

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University of Maryland, College Park

Presenter: Gerard De Castro **Senior Sponsor: Thomas Scalea**

Background: Chitosan is used as a functional biopolymer that has been recently used as a hemostat. Recently, its efficacy has been questioned due to clinical failures as a result of poor adhesiveness. The purpose of this study was to compare, in a severe groin injury model in swine, the hemostatic properties of an unmodified standard chitosan sponge to standard gauze dressing and a novel hydrophobically-modified (hm) chitosan sponge. Previous studies have demonstrated that the hm-chitosan sponge provides greatly enhanced tissue adhesion and hemostatic effect via non-covalent insertion of hydrophobic pendant groups into cell membranes.

Methods: Twenty-four Yorkshire swine were randomized to receive hm-chitosan (n=8), unmodified chitosan (n=8), or standard gauze dressing (n=8) for hemostatic control. A complex groin injury involving arterial puncture (6mm punch) of the femoral artery was made after splenectomy. After 30 seconds of uncontrolled hemorrhage, the randomized dressing was applied and compression was held for 2 minutes. Fluid resuscitation was initiated to achieve and maintain the baseline mean arterial pressure and the wound was inspected for bleeding. Failure of hemostasis was defined as pooling of blood outside of the wound. Animals were then monitored for 180 minutes and surviving animals were euthanized.

Results: Blood loss before treatment was similar between groups ($p > 0.1$). Compared to the hm-chitosan sponge group, which had no failures, the unmodified chitosan sponge group had 6 failures while the standard gauze group had 8 failures. For the unmodified chitosan sponge failures, secondary re-bleeding was observed 45 ± 9 minutes after application. Standard gauze provided no initial hemostasis after the 2 minute compression interval.

Conclusions: Hm-chitosan is superior to unmodified chitosan sponges ($p < 0.01$) or standard gauze for controlling bleeding from a lethal arterial injury. The hm-chitosan technology may provide an advantage over native chitosan-based dressings for control of active hemorrhage.

INTERMITTENT VERSUS CONTINUOUS GASTRIC ENTERAL NUTRITION IN CRITICALLY ILL TRAUMA PATIENTS: A PROSPECTIVE RANDOMIZED TRIAL

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Presenter: Michelle J. Wood **Senior Sponsor: Paul Beery II**

Introduction: The benefit of enteral nutrition in critically ill trauma patients has been demonstrated previously. The impact of whether enteral nutrition is delivered continuously or in scheduled intermittent boluses on outcome, time to caloric goal, nutritional status, and blood glucose variability has not been reported.

Methods: One hundred eighteen critically ill injured patients, age 18 or over, with at least 48 hours of anticipated mechanical ventilation, and a functional GI tract were enrolled over an 18-month period. Eligible patients were randomized to receive continuous (n=60) or intermittent (n=58) enteral nutrition. Study variables included demographics, mortality, incidence of complications, nutritional goals, caloric intake and time to goal intake, serum albumin and pre-albumin, blood glucose, and glucose variability.

Results: Thirty-one of 60 patients (51.7%) in the continuous group, and 37 of 58 (63.8%) patients in the intermittent group reached their caloric goal for at least one day during their ICU stay (p=0.183). There was no significant difference in the number of days needed to meet the caloric goal (3.6 days for continuous group, 3.0 days for intermittent). Pre-albumin and albumin were similar. There were no significant differences in gastric residual volumes, diarrhea, pneumonia or in number of ICU days, hospital days, or ventilator days. Blood glucose was less variable in the continuous group (p=0.002).

Conclusion: Intermittent and continuous feeding are comparable in time to caloric goal, achievement of caloric goal, and nutritional status. Lower glucose variability with continuous feeding may have a positive impact on mortality.

SPLIT DOWN THE MIDDLE: A FUNCTIONAL SURVIVOR OF COMPLETE TRAUMATIC HEMIPELVECTOMY

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Presenter: Bradley Thomas **Senior Sponsor: Benjamin Dart**

Background: Traumatic hemipelvectomy is defined as “unstable ligamentous or osseous hemipelvis injury with rupture of the pelvic neurovascular bundle”. Complete traumatic hemipelvectomy occurs when there is amputation of the affected extremity along with all supporting structures. There are few reported survivors of this devastating injury.

Case Presentation: A 38-year-old male was transferred to a level one trauma facility following a high-speed motorcycle collision. His left leg and hemipelvis were delivered on a second stretcher. Digital control was used to prevent exsanguination. He was taken immediately to the operating room and found to have an avulsed common iliac artery and vein which were ligated. Destructive injuries to his rectum, anus, and penis were identified. Following damage control surgery and placement of a suprapubic catheter the patient was transferred to the ICU and further stabilized. Over the next several days, he underwent a completion penectomy, right orchiectomy, closure of the rectal stump, diverting colostomy and wide debridement of the perineum. After additional debridements, a contralateral posterior thigh muscle flap and skin grafting was performed to cover the defect. He was subsequently discharged from the hospital to a rehabilitation facility twenty-nine days after the initial injury. 3 months after injury, all wounds have healed and he ambulates with a prosthesis.

Discussion: Complete traumatic hemipelvectomy is the most severe and dramatic form of open pelvic fracture. It is associated with an extremely high mortality. Early death secondary to exsanguinations is common while late death is usually due to overwhelming sepsis. Control of hemorrhage is the initial goal followed by stabilization and correction of acidosis, hypothermia, and coagulopathy. A specialized and multidisciplinary approach is required to reconstruct these patients. Vigilant critical care is also necessary to prevent and/or treat septic complications. Functional outcome, following this devastating injury is rarely reported.

IMPACT OF A DEFINED MANAGEMENT ALGORITHM ON OUTCOME FOLLOWING TRAUMATIC PANCREATIC INJURY

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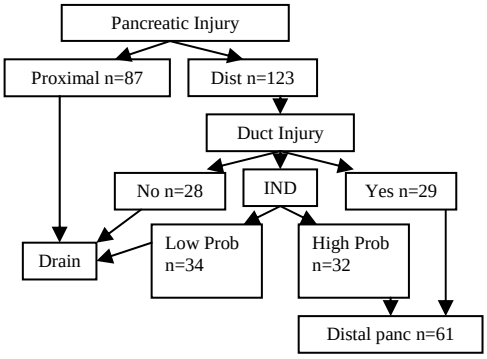
University of Tennessee Health Science Center

Presenter: John P. Sharpe **Senior Sponsor: Ben Zarzaur**

Background: The optimal management of pancreatic injuries, specifically with respect to defining ductal integrity, remains controversial. Our previous experience suggested that decisions based on probability of ductal injury might improve outcome. Consequently, a management algorithm (ALG) was developed and implemented (Figure). The purpose of this study was to evaluate the impact of this ALG on outcomes.

Methods: Consecutive patients over 13 years with pancreatic injuries subsequent to the development of the ALG were evaluated. Pancreatic injuries were defined as proximal or distal and ductal injuries classified as definite, high, low or indeterminate (IND) probability. Pancreas-related morbidity (fistula, abscess, pseudocyst) and mortality were recorded. Patients managed by the ALG were compared to the previous study (PS, n=124).

Results: 245 patients were identified. 35 died within 12 hours and were excluded. Demographics, injury severity and severity of shock (24-hour transfusions) were similar between groups. Pancreas-related morbidity for proximal injuries was 13.9% in the ALG group and 13.5% in the PS (p = 0.948). Pancreas-related morbidity was significantly reduced in the ALG group for distal injuries requiring drainage alone (11% vs 25%, p = 0.05) and for distal injuries requiring resection + drainage (26% vs 58%, p = 0.003) when compared to the PS. There was no pancreas-related mortality in the ALG group (1.6% in the PS group).



Conclusions: Adherence to a defined ALG simplified the management of traumatic pancreatic injuries and contributed to a reduction in both pancreas-related morbidity and mortality. The majority of all proximal pancreatic injuries can be treated with drainage alone. For distal injuries, a clinical decision based on defined parameters and suspicion of ductal injury dictates definitive management.

POINT: COUNTERPOINT I

Endovascular Repair of Traumatic Aortic Transections: Ready for Prime Time?

Riyad Karmy-Jones
Southwest Washington Medical Center

Steve Shackford
Scripps Mercy Hospital

FINDING THE SWEET SPOT: IDENTIFICATION OF OPTIMAL GLUCOSE LEVELS IN CRITICALLY INJURED PATIENTS

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University of California, San Francisco

Presenter: Marci B. Pepper **Senior Sponsor: Mitchell J. Cohen**

Background: Recent studies suggest that tight glycemic control in intensive care unit (ICU) patients may result in hypoglycemia and increased mortality. The correct balance of glycemic control is understudied in the critically-injured population. We reviewed patient glucose and outcomes data for a time period spanning three different glycemic control protocols ('relaxed', 'aggressive', and 'moderate'; see table) to ascertain characteristics of optimal glucose control.

Methods: We retrospectively reviewed our bioinformatics database and trauma registry for 2405 trauma ICU patients with documented fingerstick blood glucoses from May 2001 – January 2010. We extracted median blood glucose, frequency of hypoglycemic (<60mg/dL) and hyperglycemic (>180mg/dL) events per 100 patient-ICU-days, and glucose variability (measured as intra-patient standard deviation) as parameters of glycemic control. Using univariate nonparametric tests, ANOVA, and regression analysis, we investigated these parameters' association with morbidity and mortality throughout the different glycemic control regimes.

	RELAXED (n = 783)	AGGRESSIVE (n = 269)	MODERATE (n = 1353)	P value
Glucose target	<180	80-120	80-140	
On IV Insulin drip	14.9%	34.6%	25.1%	
Median glucose	130 (66-371)	120 (65-272)	125 (67-319)	**< 0.001**
Glucose variability	28 ± 18	28 ± 19	28 ± 25	0.979
Hypoglycemia/100pt-d	0.55 ± 4	2.3 ± 8	1.0 ± 5	**< 0.001**
Hyperglycemia/100pt-d	16.6 ± 26	13.30 ± 24	13.9 ± 23	**< 0.03**
ICU days (range)	4 (1-93)	3 (1-74)	4 (1-176)	**≤ 0.006**
Hospital days (range)	8 (1-184)	7 (1-102)	9 (1-332)	**≤ 0.001**
Vent days (range)	1 (0-80)	1 (0-64)	1 (0-173)	**< 0.03**
MOF	18%	14%	17%	0.300
Mortality	13%	11%	11%	0.236

Results: In our aggregate population, mortality was associated with elevated median glucose (141 vs. 125mg/dL), more frequent hypoglycemic (2.1± 7 vs. 0.88±5) and hyperglycemic (36.4±31 vs. 11.8±21) events per 100 patient-ICU-days, and higher glucose variability (39±22 vs. 26±22; all $p < 0.03$). Hyper- and hypoglycemia and glucose variability correlated with increased length of ICU and hospital stay (Kendall's tau $p < 0.001$); median glucose correlated with increased ICU stay (Kendall's tau $p < 0.05$). Regression analysis identified hyperglycemic episodes ($p \leq 0.003$) and elevated glucose ($p < 0.03$), as well as ISS and age ($p < 0.001$), to be independent predictors of mortality; insulin drip use predicted survival ($p < 0.02$). Relative to each other, our 'relaxed' regimen had high median glucose, rare hypoglycemia, and common hyperglycemia; 'aggressive' control had lower median glucose, more common hypoglycemia, and rare hyperglycemia; and the 'moderate' regimen had intermediate values for all (for intergroup differences, all $p < 0.03$; see table). No significant differences existed in multiorgan failure (MOF) or mortality between groups ($p = 0.300$ and 0.236, respectively)

Conclusions: In our single-center trauma ICU experience, primary focus on avoidance of hyperglycemic events (glucose >180mg/dL) and reduction in overall glucose (target median glucose: 125mg/dL) with liberal insulin drip use is optimal, with secondary focus on avoidance of hypoglycemic events (glucose <60mg/dL). This is achievable using a 'moderate' protocol.

THE NATURAL PROGRESSION OF INTRACRANIAL HEMORRHAGE AND NEUROSURGICAL INTERVENTION IN THE TRAUMA POPULATION

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Vanderbilt University Medical Center

Presenter: Daniel M. Koehler **Senior Sponsor: Richard S. Miller**

Objectives: Progression of post-traumatic intracranial hemorrhagic injury (IHI) is a potential complication of traumatic brain injury (TBI). Although serial neurologic evaluation is the mainstay of acute TBI management, the etiology and duration of IHI progression remains undefined. The goal of this study is to characterize risk of progression and necessity of neurosurgical intervention in TBI patients with IHI.

Methods: Retrospective study of patients admitted to an academic level 1 trauma center with blunt TBI between 7/1/2004 – 6/30/2008. Inclusion criteria: acute IHI on admission head CT, abbreviated injury score for head and neck (AIS H/N) ≥ 3, age ≥ 16 years, hospital LOS ≥ 72 hrs. All study patients underwent repeat head CT within 24 hours of admission. Outcome variables: IHI progression (lesion expansion or new IHI) and need for neurosurgical intervention (craniotomy, intracranial pressure monitor (ICPM), external ventricular drain (EVD)).

Results: 1,185 patients met study criteria. 235 patients required early (<8 hrs) neurosurgical intervention: 94 (40%) underwent immediate craniotomy and 141 (60%) required EVD or ICPM. Of the 950 remaining patients, 189 (19.9%) demonstrated IHI progression which was associated with lower arrival GCS (7.96 ± 5.01 vs. 9.90 ± 5.31; $p < 0.0001$) and higher AIS H/N scores (4.02 ± 0.68 vs. 3.69 ± 0.69; $p< 0.0001$) vs. patients with no progression. Epidural hematoma (EDH) (23.2%), intraparenchymal contusion (IPC) (24.0%), and intraventricular hemorrhage (IVH) (25.0%) were the most likely injury patterns to demonstrate IHI progression. Patients with IHI progression were more likely to require delayed neurosurgical intervention vs. those with no progression: craniotomy (3.7% vs. 0.9%; $p<0.005$) and EVD/ICPM (7.4% vs. 1.2% $p<0.0001$), respectively. Relative risk for delayed craniotomy (> 8hrs) for AIS H/N of 5 vs. 4 was 5.49 (95% CI: 1.87 -16.11). Of the 14 patients requiring delayed craniotomy, 10 (71%) occurred within 48 hours of admission for IHI progression; the remainder (4) occurred on post-injury day 4 secondary to cerebral edema. Regarding the timing of IHI progression: 3.9% of injuries continued to progress by day 3, less than 1% by hospital day 7, and no progression noted by day 10. No patients with isolated subarachnoid hemorrhage, axonal shear injury, or IVH underwent craniotomy. Mortality for immediate vs. delayed craniotomy: 23.4% (22/94) vs. 0% (0/14), $p = 0.04$; and for EVD/ICPM: 31.9% (45/141) vs. 43.5% (10/23), $p = 0.28$.

Conclusions: Patients with more severe AIS H/N and GCS scores are significantly more likely to develop progression of IHI and require delayed neurosurgical intervention. The vast majority (96.1%) of blunt TBI patients demonstrate no IHI progression by 48 hours, with all progression resolved by day 10. While delayed craniotomy was not associated with mortality, requirement of delayed placement of EVD/ICPM may indicate increased risk of mortality.

FUNCTIONAL OUTCOMES FOLLOWING BLUNT CEREBROVASCULAR INJURIES

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University of Tennesse Health Science Center

Presenter: Jennifer M. DiCocco **Senior Sponsor: Timothy C. Fabian**

Introduction: There has been confusion regarding optimal screening and treatment of BCVI, but there has been little published on functional outcomes following diagnosis. We reviewed patients with long-term follow-up to determine the functional outcomes following BCVI.

Methods: Patients with BCVI over the 53-month period ending June 2009 were identified. Primary treatment was anticoagulation/antiplatlet medications for low grade dissections or occlusions, and stents for high grade dissections and pseudoaneurysms. Charts were reviewed for demographics, associated injuries, treatments, strokes, and in-hospital mortality. Telephone interviews were conducted for follow-up. The Social Security Death Index was queried for patients that could not be contacted. A structured telephone interview was conducted using a modified functional independence measurement and functional activity measurement (FIM/FAM) questionnaire consisting of 30 questions in seven categories (self-care, sphincter control, mobility, locomotion, communication, psychosocial, and cognitive). Each question was scored from 1 (requires full assistance) to 7 (fully independent). Outcomes of the telephone interviews were compared by type of BCVI (carotid versus vertebral artery), and occurrence of stroke.

Results: 222 patients with BCVI were identified. 24 patients died during their initial hospitalization and an additional 11 patients died after hospital discharge. 74 patients (40%) were contacted for telephone follow-up and 68 completed the entire questionnaire. Mean follow-up was 35 months. Five patients were found to have a stroke on arrival to the hospital, 3 developed during their hospitalization, and 5 patients stated that they had strokes since hospital discharge. Out of a possible 210 points, the mean total score on FIM/FAM was 186.3, 185.2, and 188.1 for all patients, carotid artery injuries, and vertebral arteries injuries, respectively. There was a significant difference on total FIM/FAM scores between patients with and without strokes, 173.1 and 189.4 ($p<.05$).

Conclusions: Carotid artery injuries and vertebral artery injuries have similar functional outcomes. Aggressive treatment of patients with BCVI prevents the devastating sequelae of a stroke, and most patients return to near normal function with long-term follow-up.

Presidential Address

“The Surgeon's Role in Patient Safety: Past, Present and Future”

M. Gage Ochsner

PERCUTANEOUS TRACHEOSTOMY: TO BRONCH OR NOT TO BRONCH, THAT IS THE QUESTION

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UCSF Fresno

Presenter: La Scienya Jackson **Senior Sponsor: James W Davis**

Introduction: Percutaneous tracheostomy is a routine procedure in Intensive Care. Some surgeons perform percutaneous tracheostomies utilizing bronchoscopy. Our objective was to evaluate percutaneous tracheostomy in the trauma population and determine if the use of a bronchoscope decreases the complication rate and improves safety.

Methods: A retrospective review was completed from year January 2006 to September 2010. Inclusion criteria were percutaneous tracheostomy on the trauma service. Data collected included age, abbreviated injury scale scores and disposition. Complications were classified as early <24 hours or late >24 hours.

Results: During the four year period 12, 866 patients were admitted for trauma and 2,028 were intubated. Of these, 220 tracheostomies were completed, 205 were percutaneous. Of the percutaneous tracheostomies, 68 (33%) were performed with the bronchoscope (PTB) and 137 (67%) without (PT). There were 14 complications, 5 (PTB) and 9 (PT). Early complications were primarily bleeding and managed without difficulty; PTB 3% vs PT 3.6%. (NS) Late complications include tracheomalacia, tracheal granulation tissue, bleeding and stenosis; PTB 4.4% vs PT 2%. (NS) One major complication occurred, with loss of airway and cardiac arrest in the bronchoscopy group.

Conclusion: Percutaneous tracheostomy has a relatively low complication rate and was not different between PTB and PT. Both techniques require appropriate skill and caution to avoid loss of airway. The use of the bronchoscope is not required for percutaneous tracheostomy.

THE IMPACT OF CLOSURE AT THE FIRST TAKE-BACK: COMPLICATION BURDEN AND POTENTIAL OVER-UTILIZATION OF DAMAGE CONTROL LAPAROTOMY

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Presenter: Quinton M. Hatch **Senior Sponsor: John Holcomb**

Background: Damage control laparotomy (DCL) is a life saving technique initially employed to minimize the lethal triad of coagulopathy, hypothermia, and acidosis. Recently, it has been recognized that DCL itself carries significant morbidity and may be over-utilized. The purpose of the current study was to determine (1) if early fascial closure is associated with a reduction in post-operative complications and (2) if patients at our institution met traditional DCL indications (acidosis, hypothermia, and coagulopathy).
Methods: Retrospective review of all patients undergoing immediate laparotomy at a Level 1 trauma center between 2004-2008. DCL was defined as temporary abdominal closure at the initial surgery. Early closure was defined as primary fascial closure at initial take back laparotomy. Patients were excluded if they died prior to first take-back. Acidosis (pH <7.30), hypothermia (temperature <95.0), and coagulopathy (INR>1.5), were measured on ICU arrival.
Results: Of the 925 patients undergoing emergent laparotomy, 30% had DCL employed. Of these, 86 subjects (34%) were closed at first take back while 161 (66%) were not. Both groups were similar in demographics, ISS, resuscitation volumes, blood products, and prehospital, ED, and operating room vital signs. Univariate analyses noted intra-abdominal abscesses (8.4% vs. 21.3%), respiratory failure (14.4% vs. 37.1%), sepsis (8.4% vs. 25.1%), and renal failure (3.6% vs. 25.1%) were lower in patients closed at first take back (all<0.05). Controlling for age, gender, ISS and transfusions, logistic regression analysis noted closure at the first take-back was associated with a reduction in infectious (OR 0.28, 95% C.I. 0.12-0.66, p=0.004) and non-infectious abdominal complications (OR 0.23, C.I. 0.09-0.56, p=0.001) as well as wound (OR 0.31, C.I. 0.13-0.72, p=0.007) and pulmonary complications (OR 0.35, C.I. 0.20-0.62, p<0.001). Of patients closed at the initial take back, 78% were acidotic (33%), coagulopathic (48%), and or hypothermic (43%) on initial ICU admission.
Conclusion: Early fascial closure appears is an independent predictor of reduced complications in DCL patients. However, one in five patients closed at initial take back did not meet traditional indications for DCL upon ICU admission. This may represent an over-utilization of this valuable technique, exposing patients to increased complications. Further efforts should be directed at achieving both early facial closure as well as re-defining the appropriate indications for DCL.

IS LOW MOLECULAR WEIGHT HEPARIN SAFE FOR VENOUS THROMBOEMBOLISM PROPHYLAXIS IN PATIENTS WITH TRAUMATIC BRAIN INJURY? A WESTERN TRAUMA ASSOCIATION MULTICENTER STUDY

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Cooper University Hospital

Presenter: Michael E. Kwiatt **Senior Sponsor: Steven Ross**

Background: Venous thromboembolism (VTE) is a significant risk in trauma patients. Although low molecular weight heparin (LMWH) is effective in VTE prophylaxis, its use in patients with traumatic brain injury (TBI) remains controversial.
Objectives: In order to determine the safety of LMWH in patients with TBI we conducted a multicenter retrospective study. We hypothesized that VTE prophylaxis with LMWH would not cause an increased rate of progression of intracranial bleed in TBI patients.
Methods: This was a five year review of patients suffering intracranial hemorrhage due to blunt trauma, all of whom had at least one follow-up head CT. Patients under 18 years of age; who died or were discharged within 48 hours; required emergent abdominal, thoracic, or vascular surgery; or were receiving anticoagulants prior to injury were excluded. Patients receiving LMWH who did not have a subsequent follow-up scan were also excluded. Demographic and physiologic data as well as data regarding the use and timing of LMWH, progression of bleed from initial CT scan, neurologic outcome, survival, and occurrence of VTE were collected. Patients were divided into 2 groups: those who received LMWH and those who did not. The primary outcome was progression of intracranial bleed. Student's t-test was applied to continuous variables, and contingency table analysis to dichotomous variables, $p<0.05$ considered significant.
Results: 1215 patients were included in this study. 220 patients (18.1%) received prophylactic LMWH, and 995 (81.9%) did not (control). The LMWH group was younger (46 vs. 53 years), with more severe injury (ISS 28 vs. 21), and presented with worse GCS (8 vs. 11) than the control population. 239 of 995 control group patients (24%) were found to have progressive bleed on follow-up CT scans. In the LMWH group, 93 of 220 patients (42%) were found to have progression on follow-up CT scans ($p=0.002$). Ten percent (14/137) of patients who initially had stable serial CT scans had bleed progression after LMWH administration.
Conclusion: This retrospective study demonstrates a higher rate of progression of intracranial bleed in TBI patients receiving prophylactic LMWH. Although the patients receiving LMWH were more severely injured than the control group, these results do not support the hypothesis that LMWH is safe for VTE prophylaxis in this population. A prospective randomized controlled study is required to validate these findings.

A RARE CASE OF PULMONARY ARTERY BULLET EMBOLIS NECESSITATING OPERATIVE REMOVAL

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Presenter: Geoffrey Lam **Senior Sponsor: Gary Vercruysse**

A 34 y.o. male suffered a single gunshot wound to the proximal right thigh from a 9mm handgun. He was stable and had good pulses, normal ABI and minimal hematoma. A single wound was noted in the right thigh, and x-ray of his leg and pelvis revealed no missile. Abdominal exam and FAST were negative. Chest x-ray (CXR) revealed one missile in the left lung field. Given no prior history of trauma , computed tomography (CT) of the chest confirmed the diagnosis of bullet embolism to the left inferior branch of the pulmonary artery (PA).

Interventional radiology consultation prompted attempts at endovascular retrieval, which were unsuccessful. In the operating room a left posterolateral thoracotomy was performed. Inspection revealed no evidence of pulmonary infarction. Dissection of the left inferior pulmonary vein and artery was performed. During mobilization, the bullet was located, but became dislodged and was no longer detectable. Intraoperative CXR revealed the bullet had fallen into the right PA and was not accessible. The patient was closed with towel clips, placed in the left lateral decubitus position, and vigorous percussion of the right chest employed to relocate the missile to the left side, which was confirmed by an intraoperative CXR. He was then placed supine, the prior thoracotomy reopened, and the incision extended anteriorly. Proximal and distal vascular control was obtained and the bullet removed via a longitudinal arteriotomy. The patient recovered without complication and was discharged home on postoperative day 20.

PA bullet embolism is rare and optimal management strategy debatable. Rarer still are the 20% of bullet emboli that originate from the venous circulation. Factors affecting migration to the pulmonary circulation include force of flow, missile size, initial velocity, gravity, body position and respiratory mechanics. Most reported cases involve .22 cal bullets; their low kinetic energy dissipates quickly, and is more likely to penetrate only one vessel wall. PA bullet embolus is suspected in patients sustaining a gunshot with no exit wound and no visible bullet in the area of injury on x-ray. CXR, CT or angiogram will be confirmatory.

Although tempting, nonoperative management in the asymptomatic patient is not supported as pulmonary infarction, sepsis, bullet erosion through the PA, hemorrhage, and erosion into an adjacent structure are reported, most resulting in death. Proximal pulmonary bullet embolus near the heart additionally adds the risks of endocarditis, hemothorax and massive hemoptysis. Review of the world literature reveals that of 17 patients with bullet embolus to the pulmonary circulation, 9 patients undergoing embolectomy made a full recovery, while 7 of 8 managed conservatively died. In 4 of 9 thorocotomies for retrieval, the missile was dislodged and a second thoracotomy was required in 3 patients.

Treatment options include endovascular snare via a percutaneous approach if possible. If this is not feasible, embolectomy via thoracotomy is warranted. If necrotic pulmonary parenchyma is encountered, lobectomy is required. Use of an inflated Swan-Ganz catheter may prevent bullet migration during positioning of the patient and operative manipulation.

CONTINUOUS INTERCOSTAL NERVE BLOCKADE FOR RIB FRACTURES: READY FOR PRIMETIME?

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Methodist Hospital of Dallas

Presenter: Michael S. Truitt **Senior Sponsor: Gene Moore**

Objective: Providing adequate analgesia for patients with rib fractures continues to be a management challenge. The objective of this study is to examine our experience with the use of a continuous intercostal nerve block delivered via placement of an elastomeric infusion pump catheter (EIPC). Although this technique is being increasingly employed, little data has been published documenting its use. We hypothesized that placement of the EIPC's would provide excellent analgesia, improve pulmonary function and decrease length of stay (LOS).

Methods: Consecutive adult blunt trauma patients admitted to a busy urban trauma center, with ≥ 3 unilateral rib fractures were prospectively studied over 24 months. EIPC's were placed at the bedside in the extra-thoracic, paravertebral space and local anesthetic was infused. Respiratory rate (RR), preplacement (PRE) numeric pain scale scores (NPS) and sustained maximal inspiration (SMI) lung volumes were determined at rest and after coughing. Parameters were repeated 60 minutes after catheter placement (POST). LOS comparison was with historical controls utilizing epidural analgesia for pain control.

Results: Over the study period, 102 patients met inclusion criteria. Mean age was 69 years (21-96), mean ISS was 14 (9-16), and the mean number of rib fractures was 5.8 (3-10). Mean NPS improved significantly (PRE NPS at rest =7.5 vs POST NPS at rest = 2.6, $p < .05$, PRE NPS after cough = 9.4, POST after cough = 3.6, $p < .05$) which was associated with an increase in the SMI (PRE SMI = 0.4L, POST SMI = 1.3L, $p < .05$). RR decreased significantly ($p < .05$), and only 2/102 required mechanical ventilation. Average LOS for the study population was 2.9 days compared with 5.9 in the historical control. Catheters remained in place an average of 122 hours (85-343); no procedural or drug related complications occurred.

Conclusions: Utilization of EIPCs significantly improves pulmonary function, pain control and shortens LOS in patients with rib fractures.

POINT: COUNTERPOINT II

Operative Fixation of Flail Chest and Rib Fractures

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NATURAL HISTORY OF MINIMAL AORTIC INJURY AFTER BLUNT TRAUMA: SELECTIVE NONOPERATIVE MANAGEMENT IS SAFE

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Presenter: Jasmeet Paul **Senior Sponsor:** Karen Brasel

An increasing number of Minimal Aortic Injuries (MAI) are being identified with modern CT imaging techniques. The optimal management and natural history of these injuries is unknown, although many are now being managed nonoperatively. Although there is no widely accepted definition of MAI, a previously reported grading system has been developed but has not been validated.

Materials and Method: A retrospective chart review of all blunt trauma patients who underwent CT aortogram to evaluate for Blunt Aortic Injury (BAI) was undertaken. MAI were defined as those with a non threatening appearance. Patients deemed to have a MAI were managed nonoperatively, those with a Severe Aortic Injury (SAI) underwent repair. Data collected included; age, mechanism of injury, ISS, type and location of aortic injury, ICU LOS, overall LOS, ventilator days, disposition, and mortality. All BAI were retrospectively graded according to the Presley Trauma Center CT Grading System of Aortic Injury.

Results: 47 patients with BAI were identified. 32 were classified as severe injuries, and 15 were considered MAI (32%). 19 underwent operative repair, 13 underwent endovascular stent graft repair, and 15 were managed nonoperatively. The average ISS was 31 +/- 10 and average age was 44 +/- 20 with no significant difference across treatment groups. There was no difference in overall or ICU LOS. The nonoperative group had a shorter duration of ventilator days (1.1 vs 4.28 p=0.02). There were 5 deaths, none in the nonoperative group. None of these patients required subsequent intervention. All nonoperative patients had follow up imaging at median of 4 days; on CT aortogram 5 injuries had resolved, 8 had stable intimal flaps or pseudoaneurysm, and 2 had no detectable injury on subsequent aortogram. 13 of 15 patients classified as minimal injury by the Presley Grading System were successfully managed nonoperatively, as were 2 patients classified as severe injury. Two patients with minimal injury underwent stent placement.

Management	N	MAI	ISS	mortality
Nonoperative	15	13	28 +/- 11	0/15
Stent Graft	13	4	32 +/- 12	1/13
Open repair	19	0	31 +/- 9	4/19

Conclusion: Almost 1/3 of our BAI were safely managed nonoperatively. Patients with MAI should be considered for selective nonoperative management in a multidisciplinary approach with close radiographic follow up. The Presley Grading system correctly classifies 86% of patients for subsequent management, and can be used as a guide to identify patients that do not need intervention.

Paint the Ceiling Lecture

In 1997, Dr. Gregory “Jerry” Jurkovich delivered his Presidential Address entitled “Paint the Ceiling: Reflections on Illness”. This was a personal account of his battle with non-Hodgkin’s lymphoma. His deep insights were shared from a patient’s perspective, even that of a stained ceiling that he observed while lying on his back. He proposed that future WTA Scientific Programs have some time “dedicated to our patients and to the Art of Medicine”.

“Je Le Pansay”

Jefferson McKenney, M.D.

INSURING THE UNINSURED: FINANCIAL IMPACT OF HEALTH CARE REFORM ACT OF 2010 ON TRAUMA CENTERS

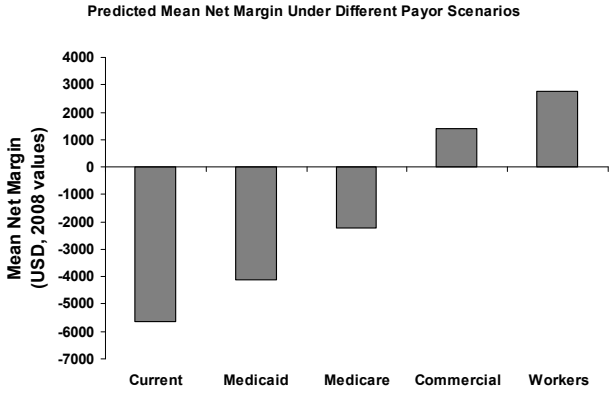
S Shafi, G Ogola, N Rayan, R Kudyakov, S Barnes, N Fleming, D Ballard
Institute for Health Care Research and Improvement, Baylor Health Care System, Dallas, TX

Presenter: Shahid Shafi **Senior Sponsor: Shahid Shafi**

Introduction: Economic viability of trauma centers continues to be threatened by unreimbursed care provided to patients without health insurance. Health Care Reform Act of 2010 is likely to benefit trauma centers by mandating universal health insurance by 2014. However, the financial benefit of this mandate will depend upon the level of reimbursement provided. We hypothesized that compensation for the care of the uninsured at reimbursement rates currently used by government-run programs will be inadequate for trauma centers.

Methods: Financial data for first hospitalization were obtained from an urban Level I trauma center for three years (6666 patients, 2006-08) and linked with clinical information in the trauma registry. Patients were grouped into five categories of payments: Commercial (29%), Medicaid (8%), Medicare (20%), Workers compensation (6%), and Uninsured (37%). Prediction models for costs (total=direct plus indirect) and payments were developed for each payment category using multiple regression (log gamma distribution), adjusting for age, gender, race/ethnicity, transfers, injuries, injury severity (using Injury severity score, Glasgow Coma Scale, and first systolic blood pressure upon presentation), and survival. Next, these models were used to predict payments that could be expected if uninsured patients were covered by different insurance types. Results are reported as net margin per patient (payments minus total costs) for each insurance type, with 95% confidence intervals (CI), discounted to 2008 dollar values.

Results: Patients were typical for an urban trauma center (median age 43 years, 58% males, 80% blunt mechanism, mortality 6%, median length of stay 4 days). Overall, the trauma center lost over $5000 per patient (Figure). These losses were encountered in patients without insurance (Net loss $14,343, 95% CI $13,939 - $14,746), Medicare (Net loss $4838, 95% CI $4674-$5001) and Medicaid (Net loss $15,740, 95% CI $ 14,181 - $17,299). Patients with commercial insurance were profitable (Net profit $5295, 95% CI $4735-$5855) as well as those with workers compensation (Net profit $6860, 95% CI $6369 - $7352). Payments for the care of the uninsured at Medicare/Medicaid level would result in continued losses for the trauma center. However, reimbursements at commercial insurance or workers compensation levels would make the trauma service line economically viable (Figure).



Conclusions: Health Care Reform Act of 2010 would result in continued losses for trauma centers if uninsured are covered with Medicare/Medicaid type programs.

SURGERY IS ALL GLOBAL- HOW THE WTA PUT ME ON THE PATH

Michael Hauty
Providence Hood River Hospital & Medecins Sans Frontieres-USA

Presenter: Michael Hauty **Senior Sponsor: Michael Hauty**

The bonds among WTA members give a special meaning to our organization. Often we glean insight and even inspiration from fellow members' experiences.

Listening to John McGill deliver the second Paint the Ceiling lecture in Lake Louise, Canada in 1998, I had only an inkling that the talk would precipitate a major professional rebirth in my life.

John spoke of his mission with Medecins Sans Frontieres/Doctors Without Borders to Afghanistan late in the era of Soviet occupation. His passion for the work and for MSF propelled me to complete my application, change jobs and brush up my French skills.

Ten years later, I've completed five short-term surgical missions in French-speaking Africa and become an experienced senior surgeon with MSF. More importantly other surgeons, perhaps inspired by experiences such as mine and countless others have begun their own adventures in international health.

The same decade has seen this process become an international phenomenon. The Global Health movement now includes a significant surgical component. Avenues and opportunities exist on every level from the World Health Organization (GIEESC) to the American College of Surgery's Operation Giving Back (OGB) program and local medical staff missions for US surgeons to become involved as "global citizens".

Trauma and acute care surgeons are uniquely qualified for the challenges involved in practicing surgery in resource poor settings. Our cumulative international experiences will impact national issues of rural surgery, workforce shortages and surgical training programs.

VINTAGE HYDROPLANES AND VINTAGE DRIVERS – AORTIC ENDOVASCULAR STENTS MAY BE PROBLEMATIC

GC Hughes, D Kappel
West Virginia University

Presenter: G. Chad Hughes **Senior Sponsor: David Kappel**

The Vintage and Historic division of the American Power Boat Association (APBA) is a popular and steadily growing division. These members of the APBA are generally older owner/drivers (including the senior author) and the historic boats they drive do not have modern safety designs incorporated (e.g. safety capsules).

A 66 year old male driver whose boat lost power in a turn was run over by a trailing boat. The skid fin of the second boat inflicted an open pneumothorax and the injured driver was compressed into the cockpit. Initially the chest wound was repaired and an aortic stent placed for an aortic dissection at the arch. The patient was discharged to be followed at a tertiary facility close to home.

In the ensuing six months the patient underwent four additional operations as a result of complications with the first stent that resulted in a pseudo-aneurysm. Arch reconstruction and a second stent was performed but in follow-up the patient had developed a Type A retrograde dissection. Ultimately the patient required a prosthetic arch reconstruction, aortic valve replacemnt and a left carotid stent.

THE IMPACT OF PRE-DONOR MANAGEMENT ON THE NUMBER OF ORGANS TRANSPLANTED PER DONOR: RESULTS FROM THE UNOS REGION 5 PROSPECTIVE DONOR MANAGEMENT GOALS STUDY

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Cedars-Sinai Medical Center

Presenter: Darren J. Malinoski **Senior Sponsor: Carlos V.R. Brown**

Objectives: There continues to be a shortage of organs available for transplantation. After consent for donation, many organ procurement organizations (OPOs) have implemented critical care endpoints as donor management goals (DMG) in order to maximize organ utilization. Meeting DMGs prior to procurement has retrospectively been shown to be associated with an increase in organs transplanted per donor (OTPD). Maintaining standard critical care of potential organ donors by intensivists prior to consent is encouraged, but the impact that this pre-donor management has on outcomes has not been studied.

Hypothesis: Meeting DMGs prior to consent will lead to more OTPD.

Design: Prospective interventional study.

Methods: In 2008, all eight OPOs in UNOS Region 5 collaborated to prospectively implement nine critical care endpoints as DMGs: a mean arterial pressure 60-100 mmHg, central venous pressure 4-10 mmHg, ejection fraction $\geq$50%, PaO2:FiO2 $\geq$300, arterial pH 7.3-7.45, serum sodium 135-155 mEq/L, serum glucose <150 mg/dL, urine output 0.5-3 cc/kg/hr, and low-dose vasopressors. Data on every donor from July 2008 to January 2009 were collected and included donor age, serum creatinine (Cr), and the disposition of each organ. "DMGs met" was defined a priori as achieving any 7 of the 9 DMGs and this was recorded at the time of consent for donation to reflect hospital pre-donor management, 12-18 hours later, and prior to organ recovery. The primary outcome measure was $\geq$ 4 OTPD and binary logistic regression was used to identify independent predictors of this outcome with a $p < 0.05$.

Results: There were 380 standard criteria donors with 3.6 +/- 1.7 OTPD. 15% had DMGs met at the time of consent, 33% at 12-18 hours, and 38% prior to procurement. 48% had $\geq$ 4 OTPD. Donors with $\geq$4 OTPD had significantly more individual DMGs met at all three timepoints as well as a greater increase in the number of goals met from consent to 12-18 hours (1.1 vs. 0.7, p=0.049). Independent predictors of $\geq$ 4 OTPD were age (OR=0.95 per year), final Cr (OR=0.74), DMGs met at consent (OR=1.9), and DMGs met prior to procurement (OR=2.2). The DMGs with the most significant impact were ejection fraction (OR=3.3) and PaO2:FiO2 (OR=3.2) prior to procurement.

Conclusion: Having DMG's met at the time of consent as well as prior to procurement were both associated with achieving $\geq$ 4 OTPD. However, only 15% of donors have DMGs met at the time of consent. The critical care management of potential organ donors prior to consent affects outcomes and should remain a priority in the intensive care unit.

DELAYED INTRACRANIAL HEMORRHAGE AFTER BLUNT TRAUMA: ARE PATIENTS ON PRE-INJURY ANTICOAGULANTS AND PRESCRIPTION ANTIPLATELET AGENTS AT RISK?

K Peck, C Sise, S Shackford, M Sise, R Calvo, D Sack, S Walker, M Schechter
Scripps Mercy Hospital

Presenter: Kimberly Peck **Senior Sponsor: Steven R. Shackford**

Introduction: Trauma centers are more frequently evaluating patients who are on anticoagulants or prescription antiplatelet agents (ACAP) at the time of injury. Because there are reports of delayed intracranial hemorrhage after blunt trauma in this patient group, we evaluated these patients with an admission head CT (CT1) followed by a routine repeat head CT (CT2) in 6 hours. We hypothesized that among patients with no traumatic findings on CT1 and a normal or unchanged interval neurologic exam, the incidence of clinically significant delayed intracranial hemorrhage would be zero.

Methods: We retrospectively reviewed adult blunt trauma patients admitted to our Level I trauma center from January 2006 to August 2009 who were on pre-injury ACAP. We reviewed medications, mechanism of injury, head CT results and outcomes. Demographic data, injury severity scores, International Normalized Ratio (INR) and neurologic examinations were recorded. We determined the incidence of delayed intracranial hemorrhage on CT2 for patients with a negative CT1.

Results: Five-hundred patients qualified for the protocol (Fig.1). Mean age was 75 years; 243 (49%) were male. Fall from standing was the most common mechanism of injury in 419 patients (84%). Warfarin alone was taken in 68%, clopidogrel alone in 25% and other agents in 2%. Five percent of patients were taking ≥2 agents. Mean INR for patients on warfarin was 2.6. Four-hundred twenty-four patients had a negative CT1. Of those patients, CT2 was obtained in 362 (85%) and was negative in 358 (99%). Four (1%) patients with a negative CT1 had a positive (n=3) or equivocal (n=1) CT2. All of the changes on CT2 were minor, did not require intervention and had either resolved or stabilized on third head CT (CT3). Of the four patients with positive/equivocal CT2, none had a change in neurologic exam; however, two had symptoms that could be attributed to head injury. Three were discharged home and one died of cardiac disease unrelated to head trauma.

Conclusions: The incidence of delayed intracranial hemorrhage in our study was 1%. However, this was clinically insignificant. Among patients on ACAP with a negative CT1 and a normal or unchanged neurologic exam, a routine CT2 is unnecessary. We recommend period of observation to recognize those patients with symptoms that could be due to delayed intracranial hemorrhage.

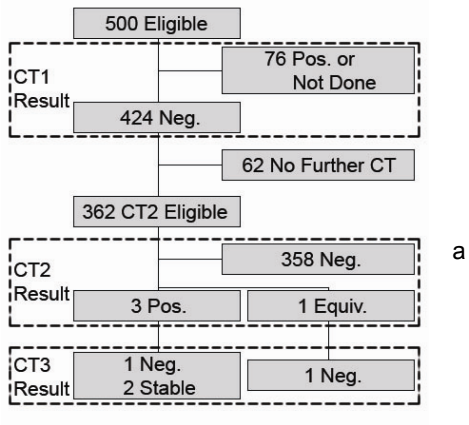


Figure 1. Patient Flow Diagram

Founders Basic Science Lecture

Throughout the years, the Western Trauma Association has matured as an academic society while maintaining the cherished elements of friendship, collegiality and family. In honor of this unique spirit, a founding member has generously provided the idea and most of the financial support for an annual *Founders' Basic Science Lectureship*. The purpose of this Lecture is to further enhance the educational value of our Scientific Meeting relative to the area of basic science research. This Lecture reflects the vision and dedication of our founding members and will hold a prominent place in all future programs.

Inflammation after Injury: Sniffing the Trail from Femur Fractures to Formyl Peptides

Carl Hauser, MD

THE RELATIONSHIP OF OBESITY AND COMPLICATIONS POST-TRAUMA IN HIGH-ENERGY PELVIC AND ACETABULAR FRACTURES

J Richards, B Morris, O Guillamondegui, K Sweeney, W Obremskey, P Kregor
Vanderbilt University Medical Center

Presenter: Justin E Richards **Senior Sponsor: Richard S Miller**

Introduction: Elevated body mass index (BMI) has been identified as a potential risk factor for complications in operatively treated pelvic trauma. We hypothesized that obesity (BMI≥30) is a risk factor for complications in both operative and non-operative pelvic and acetabular fractures.

Methods: Five-year retrospective data collection of all isolated pelvic and acetabular fractures presenting to a Level-1 trauma center, excluding pediatric (age <18 years) patients, ballistic injuries, those with concomitant long bone fractures, or an Abbreviated Injury Scale score >2 in any other body region. Baseline demographic and injury data was collected. BMI (kg/m^2) was calculated from trauma admission documentation. Injuries were characterized by anterior-posterior (AP), inlet, outlet, and Judet pelvic radiographic images. Fractures were classified as pelvic, acetabular, or combined pelvic/acetabular fractures. Fractures were additionally documented as operative or non-operative. Complications during the immediate hospitalization were identified by the institution's Trauma Registry of the American College of Surgeons (TRACS) database including: wound infection, dehiscence, deep venous thrombosis, pulmonary embolus, pneumonia, and development of decubitus ulcers. Multivariable logistic regression analysis was performed testing the effect of obesity on complications, adjusting for potential confounders of age and Injury Severity Score (ISS).

Results: 244 patients were identified. Mean BMI was 27.4±6.8 with sixty-eight (27.0%) obese patients. Fractures included: 97 pelvic, 117 acetabular, and 30 combined pelvic/acetabular. Complications were identified in 20 patients. There were no differences in complication frequency and the type of fracture (6/97 pelvic, 10/117 acetabulum, 4/30 combined pelvic/acetabulum; p=0.45). One-hundred and two fractures (42%) required operative intervention. Complications occurred with similar frequency among operative (13/142) and non-operative (7/95) fractures (p=0.5). There was a significant difference in age (48.9±22.1 vs. 37.7±16.6, p=0.005) and ISS (17.2±5.9 vs. 12.4±4.0, p<0.001) when compared to the primary outcome. Mean BMI of patients with complications was significantly higher (31.9±9.5 vs. 27.0±6.5, p=0.001). Complications occurred more frequently in obese (BMI≥30) patients (13.2% vs. 6.3%, p=0.075). Logistic regression revealed obesity (OR: 2.87, 95% CI: 1.02-8.04) as a significant risk factor for complications, after adjusting for age (OR: 1.03, 95% CI: 1.01-1.06) and ISS (OR: 1.20, 95% CI: 1.10-1.32).

Conclusions: Obesity is a risk factor for complications after high-energy pelvic trauma. This investigation determined a significant risk associated with obesity for complications post-trauma in both operative and non-operative pelvic injuries.

A DIRECT COMPARISON OF HELICOPTER VS. GROUND TRANSPORTATION OF INJURED TRAUMA PATIENTS

W Bromberg, M Busken, M Hamilton, E Bonner, E Meister, MG Ochsner
Memorial University Medical Center

Presenter: William J. Bromberg **Senior Sponsor: M. Gage Ochsner**

Objective: In an era in which the safety and cost-effectiveness of helicopter emergency medical transport (HEMS) is being scrutinized we felt it imperative to compare outcomes of adult trauma patients transported via HEMS versus ground transportation (GT) to a Level I trauma center. This is the first study to compare these outcomes in the United States comparing similar patients in a prospectively collected database.

Methods: All requests for helicopter transport to our Level I trauma center for adult, trauma patients over a one year period were identified and patient information was collected in a prospective database. As approximately 20% of HEMS requests to our institution are subsequently completed by GT due to non-clinical reasons (e.g. weather, mechanical difficulty, etc.) this became our control group. We were therefore able to compare outcomes between two populations in whom HEMS was deemed clinically necessary but only completed by air in 80%. Charted data collection of these patients was performed and demographics and outcomes reviewed retrospectively. We used TRISS methodology to calculate probability of survival, Ps= 1/(1+e-b); where b=βo + β1(RTS) + β2(ISS) + β3(Age).

Results: A total of 306 patients were included in this study of which 246 (80.39%) were transported by HEMS and 60 (20.8%) by GT. T this here was no statistically significant difference in mean age (P=.4320), gender frequency (P=.07), mean ISS (P=.170), temperature (P=.4910), base deficit, or mean SBP (P=.571) HEMS versus GT. Transport distance was significantly greater in the GT group (65.47 miles v. 48.90 miles, P <0.001), however transport time was greater in the HEMS group. Arrival mean GCS was significantly worse in the HEMS group (10.85 v. 13.12, P= 0.001).
Our primary outcome endpoint was 30-day mortality, based on TRISS analysis using coded ISS and RTS (Revised Trauma Score) and MTOS logistic coefficients from 1987. TRISS analysis revealed W statistic of 4.878 more lives per 100 were saved in HEMS, (Z= 4.878, p= .01), while with GT W statistic of 1.82 more lives per 100 were saved in GT (Z= .4467, p =.0672). A subset analysis found a non-significant increased chance of survival with HEMS versus GT for those with ISS greater than 15 (OR=1.61, CI95%=.395-3.29), and for those with ISS 25 or greater (OR=1.36, CI95%=.365-5.08). We found no statistically significant difference in mean hospital LOS (P=.7750) or mean ICU LOS (P=.3570) between HEMS and GT groups.

Conclusions: Under current protocols the use of HEMS transport does indicate there was a significantly increased probability of 30 day survival for substantially comparable patient population. Further analysis is necessary to determine the elements of HEMS responsible for this difference and protocols developed to better differentiate those patients who benefit from HEMS transport.

OPTIMAL POSITIONING FOR EMERGENT NEEDLE THORACOSTOMY: A CADAVER BASED STUDY

K Inaba, BC Branco, M Eckstein, DV Shatz, DJ Green, TT Noguchi, D Demetriades
Division of Trauma and Surgical Critical Care, University of Southern California, Los Angeles, CA

Presenter: Kenji Inaba **Senior Sponsor: David V. Shatz**

Background: Needle thoracostomy is an emergent procedure designed to relieve tension pneumothorax. High failure rates due to the needle not penetrating into the thoracic cavity have been reported. ATLS guidelines recommend placement in the 2nd intercostal space, midclavicular line using a 5-cm needle. The purpose of this study was to evaluate placement in the 5th intercostal space, midaxillary line, where tube thoracostomy is routinely performed. We hypothesized that this would result in a higher successful placement rate.

Methods: Twenty randomly selected unpreserved adult human cadavers were evaluated. A standard 5cm needle was placed in both the 5th intercostal space at the midaxillary line and the traditional 2nd intercostal space at the midclavicular line in both the right and left chest walls. The needles were secured and bilateral thoracotomies performed to assess needle penetration into the pleural cavity. The right and left hemithoraces were analyzed separately for a total of 80 needles inserted into 20 cadavers. The thickness of the chest wall at the site of insertion was then measured for each needle.

Results: A total of 14 male and 6 female cadavers were studied. Overall, 100% (40/40) of needles placed in the 5th intercostal space and 57.5% (23/40) placed in the 2nd intercostal space entered the pleural cavity ($p<0.001$). Right chest; 100% vs. 60% ($p=0.003$) and left; 100% vs. 55% ($p=0.001$). Overall, chest wall thickness was 3.5 ± 0.9 cm at the 5th intercostal space and 4.5 ± 1.1 cm at the 2nd intercostal space ($p<0.001$). Both right and left chest wall thicknesses were similar (right, 3.6 ± 1.0 cm vs. 4.5 ± 1.1 cm, $p=0.007$; left, 3.5 ± 0.9 cm vs. 4.4 ± 1.1 cm, $p=0.008$).

Conclusions: In a human cadaveric model, needle thoracostomy was successful in 100% of attempts at the 5th intercostal space but only 57.5% at the traditional 2nd intercostal position. On average, the chest wall was 1cm thinner at this position which may have facilitated successful decompression. Live patient validation of these results is warranted.

PANEL OF EXPERTS

Moderator:

R. Stephen Smith

Panel:

M. Gage Ochsner

John Holcomb

Tom Scalea

Robert Maxwell

GERIATRIC TRAUMA SERVICE: A ONE YEAR EXPERIENCE

A Mangram, VK Shifflette, CD Mitchell, M Lorenzo, MS Truitt, A Goel, M Lyons, DJ Nichols, EL Dunn
Methodist Dallas Medical Center

Presenter: Alicia Mangram **Senior Sponsor: Alicia Mangram**

Background: Trauma centers nationwide are treating increased numbers of elderly trauma patients due largely to the aging population within the United States. Many studies have demonstrated the physiological differences between older trauma patients compared to younger trauma patients. These differences, along with co-existing medical co-morbidities, make caring for this population challenging. To meet these challenges, we organized a geriatric trauma service specifically designed to take a more aggressive, multidisciplinary stance to the care of the geriatric trauma patient.

Methods: We created a geriatric trauma service at our level II trauma facility. We opened a specialty unit, called the G-60 unit, for admission in August 2009. Inclusion criteria included all trauma patients older than the age of 60 with a traumatic injury within the previous 48 hours that warranted hospital admission. Data was abstracted from our G-60 unit from the period of August 2009 to July 2010. We compared this data to a similar patient population (control group) from January 2008 to December 2008. Variables such as average emergency department (ED) length of stay (LOS), average ED to operating room (OR) time, average intensive care unit (ICU) LOS, average hospital LOS, urinary tract infections (UTI), respiratory failure (RF) were analyzed.

Results: Our Trauma Data Bank yielded 673 patients for the above queried time period. The G-60 group contained 393 patients, while the control group had 280 patients. Injury severity scores were similar between groups (10 v 11, $p>0.05$). The G-60 group tended to be slightly older with an average age of 77 versus 75 years. Statistically significant decreases were seen among the following categories: ED LOS (4.2 v 6.1 hours, $p<0.05$); ED to OR time (37.6 v 52.9 hours, $p<0.05$); ICU LOS (3 v 5.2 days, $p<0.05$); hospital LOS (4.8 v 7 days, $p<0.05$); UTI (6 v 11, $p<0.05$); and RF (5 v 19, $p<0.05$). Mortality rates decreased from 5.7% to 3.8% over the study time period but this did not reach statistical significance ($p=0.2$).

Conclusion: Our data from the one year experience of our G-60 trauma service shows that a geriatric trauma unit that addresses the specific needs of elderly trauma patients can lead to a more streamlined hospital stay, a reduction in morbidity, and a trend towards decreased mortality.

ANNUAL PEDIATRIC PEDESTRIAN EDUCATION DOES NOT IMPROVE PEDESTRIAN BEHAVIOR

D Livingston, I Suber, D Snyder, S Clancy, M Passannante, R Lavery
UMDNJ-New Jersey Medical School

Presenter: David H. Livingston **Senior Sponsor: David H. Livingston**

Introduction: Pediatric pedestrian injuries are a major health care concern, specifically in urban centers. An established educational program (WalkSafe™), given one time during the school year, has been shown to improve childhood pedestrian safety in other locales. We examined whether this program could create similar long term cognitive and behavioral changes in our school-aged children.

Methods: An established pediatric pedestrian curriculum was modified slightly for use in our area. Students K-4th grade were exposed to the program (1 time per year for 2 years) which consisted of classroom education and an interactive assembly. Short term cognitive knowledge was evaluated using standardized pre-, post and 3 month follow-up tests. Long term knowledge was assessed by comparing scores as students advanced in grade from year 1 to 2 of the program (e.g., K to 1st, 1st to 2nd etc). After year 2 at 5 schools, pedestrian behavior was measured though direct observation of children on city streets. The program was approved by university and school board IRBs.

Results: Over the 2 years, 1564 students from 9 schools were educated. In both Y1 and Y2, all students had a significant gain in test scores at post-test and 3 months (Table). In contrast ***only*** students moving from grade 3 to 4 demonstrated long term retention (Y2-Pre vs. Y1-3m).

Grade	Y1-Pre	Y1-Post	Y1-3m	Y2-Pre	Y-2 Post	Y2-3m
K-1	6.4	7.5*	7.7*	6.6¶	7.6*	8.5*
1-2	7.3	8.1*	7.8*	6.7¶	7.2*	7.4*
2-3	6.6	7.3*	7.3*	6.8¶	7.5*	7.6*
3-4	6.4	7.3*	7.1*	8.0¶	8.4*	8.4*

Within group, ANOVA, GLM, * $p<0.05$ vs. Pre test in that year; ¶ $p<0.05$ vs. Y1-3m

Only 30% of children walk with an adult. Direct observation showed 64% of children stopped at the curb but only 8% looked left-right-left (LRL). Children walking alone were more likely to cross mid block compared to those walking with an adult (12% vs. 3%; $p<0.001$). Teacher surveys reported more grade 3-4 children walked alone vs. earlier grades.

Conclusions: A one time annual educational program resulted in long term knowledge retention between grades 3 to 4 only. In contrast, scores in younger grades reverted to baseline values seen in Y1. Short term knowledge gains were seen in all grades for both years. As older children more often walk alone we postulate that the improved retention may be the result of repeated exposure and practice as a pedestrian. Cognitive knowledge did not appear to translate into improved pedestrian behavior. The efficacy and impact of a one time educational program may be insufficient to change long term behavior and must be re-evaluated.

ON A ROLL: A THIRTY YEAR REVIEW OF FARM DEATHS

J Haan, D Hauschild, C Yates, J Ward, S Helmer
The University of Kansas School of Medicine - Wichita Via Christi Hospital on Saint Francis

Presenter: James M. Haan **Senior Sponsor: James M. Haan**

Background: Agricultural work is inherently dangerous, causing numerous traumatic injuries and deaths each year, yet injury incidence and predominant mechanisms are poorly described. Various farm equipment safety interventions (roll bars, enclosed cabs, enclosed moving components) have been implemented, but efficacy remains unclear. This study's purpose was to evaluate the trends in agricultural mortality before and after implementation of safety initiatives.

Methods: A retrospective review of Kansas mortality data from agriculture-related injuries between 1/1/79 to 12/31/09 was conducted. The 30 year period was stratified to compare efficacy and safety of interventions: Period I (the initial 20 years; very few initiatives) and Period II (the last 10 year period; majority of safety initiatives implemented). Demographics and injury patterns were evaluated by mechanism (vehicle, farm equipment, livestock and other).

Results: There were 660 agricultural-related deaths during the 30-year period. Mean age was relatively stable at 49 years and there was an increase in female deaths from 5.8% to 11.7% (P=0.01). There was no significant difference in mechanisms of injury (vehicle, farm equipment, livestock and other) between study periods. Mortality associated with tractors decreased (71.5 vs. 53.9%) and ATV's increased (4.2 vs. 22.0%) between periods (Table 1; P<0.001). Tractors remain the primary cause of mortality overall. Rollover mortality did not differ for any specific farm vehicular class when comparing Periods I and II or overall (36.9 vs. 37.1%). For farm mechanical equipment mortality there was a decrease (86 vs. 50%) in "caught in equipment," with a concomitant increase (7% vs. 39%) in those killed by "crush injury" (P=0.006).

Period	**ATV**	Truck	**Tractor**	Combine	Other Farm Vehicle	Crop Duster	Other Vehicle
I	4% (13)	15% (45)	72% (221)	3% (9)	6% (17)	0.3% (1)	1% (3)
II	22% (31)	16% (23)	54% (76)	2% (3)	5% (7)	0.7 (1)	0% (0)

Conclusion: Despite common perceptions, tractors remain the most dangerous piece of farm equipment. Farm vehicle-associated mortality from rollovers remained unchanged within the two periods despite the availability of rollover bars and enclosed cabs. Whether this is due to safety initiatives being de-activated by the primary occupant is uncertain. ATV use has increased and plays a more prominent role in agricultural deaths, again predominantly from rollover injury. Encouragingly, the application of safety devices to enclose and stabilize machinery has led to an overall decrease in the incidence of mortality associated with tractors and "caught in equipment," bearing in mind that tractor use has in part been supplanted by ATV use. However, vehicular-related deaths still represented the majority of all deaths with tractor-related deaths accounting for greater than 50% of farm vehicle deaths, and of those 41% were due to rollover accidents. Expanded rural education as well as further development and use of safety devices is warranted to curtail farm-related injuries and deaths.

IDENTIFYING TRAUMA SYSTEM IMPROVEMENT OPPORTUNITIES BASED ON THE GEOGRAPHIC DISTRIBUTION OF SEVERELY INJURED PATIENTS

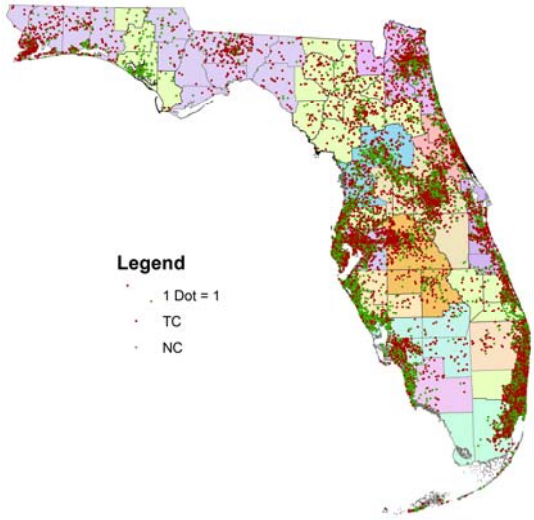
D Ciesla, E Pracht, J Cha, B Orban
University of South Florida

Presenter: D Ciesla **Senior Sponsor: D Ciesla**

Background: Despite decades of trauma system development in Florida, many severely injured patients fail to reach a trauma center (TC) for definitive care. The purpose of this study was to 1) define the geographic regions served by Florida's 21 designated trauma centers, 2) compare these regions to the 19 state defined Trauma Service Areas (TSAs) and 3) define the geographic distribution of severely injured patients that do not access the state's trauma system. We hypothesized that the distribution of patients accessing trauma centers would not conform to the TSAs.

Methods: Severely injured patients (ICISS < 0.85) discharged from Florida hospitals were identified using the 2009 Florida ACHA database. The patient home zip code was used as a surrogate for injury location and plotted on a map. The "natural" trauma service area was defined by a radial distance containing 75% of trauma patient discharges from each TC and was compared to the Florida TSA map. Zip codes from patients discharged from non-trauma center (NC) hospitals were plotted and compared to the natural and state defined trauma service areas.

Results: Of the 17054 severely injured patients in 2009, only 10056 (58.97%) were discharged from designated TCs. The natural trauma service areas varied in size from 10 to 75 miles. The areas served by the TCs did not regularly conform to the state defined TSAs. Of the 6998 patients discharged from an NC, 87% were located inside the natural trauma service areas. The geographic distribution showed several regions where few severely injured patients were treated in TCs. Conversely, there were several regions where severely injured patients were treated at both TCs and NCs.



Conclusions: Although there are 21 designated trauma centers in Florida, a substantial proportion of severely injured patients do not access the trauma system and are at risk for suboptimal care. Access to the trauma system seems to be influenced more by proximity to TC than the state defined TSAs. The distribution of severely injured patients that do not reach TCs presents an opportunity for improvement in Florida's trauma system. Those within the natural trauma service areas may benefit from improved primary and secondary triage guidelines and interfacility transfer agreements, while concentrations of patients outside the natural trauma service areas may point to regions where additional trauma centers are needed.

PREHOSPITAL THAWED PLASMA: A PRELIMINARY REPORT

D Smoot, M Park, J Osborn, M Zielinski, H Schiller, S Zietlow
Mayo Clinic

Presenter: Dustin Smoot **Senior Sponsor: Scott Zietlow**

Background: Rural trauma centers have longer transport times than urban counterparts thus negatively impacting patient outcome. Our rural ACS Level I Trauma Center's initiatives to address this issue include an auto-launch helicopter system and equipping our flight crews with packed red blood cells. Additionally, the importance of early administration of plasma in severely injured trauma patients has prompted us to carry thawed plasma on our helicopter transport. We examined our first two year experience since the inception of the pre-hospital thawed plasma protocol.

Methods: A retrospective review of the Trauma and Flight registries was performed from February 1st, 2008 through September 1st, 2010. Demographic and laboratory data are expressed as median [interquartile ranges].

	Trauma patients (n =10)
Age (years)	71.5 [30-75.3]
Male (%)	80
ISS	25.5 [16.8-29.3]
LOS (days)	4.5 [1.8-24.8]
Death (%)	40
Admission INR	1.6 [1.3-2.8]
Admission Lactate	2.8 [1.7-5.7]
Admission Base Deficit	-4.1 [-12.5- -0.5]
Admission PLT	149 [114-180]
Admission PTT	30 [28-42]
Admission HgB	10.8 [10.1-13.5]
Pre-hospital Coumadin (%)	50

Results: Sixteen patients were administered thawed plasma by our prehospital flight crew; ten patients had traumatic injuries (Table). Five of these patients were administered plasma with packed red cell transfusion in response to bleeding and of these 5 patients, 3 patients went on to require massive transfusion. The remaining 5 patients were all on Coumadin prior to their injuries and received thawed plasma in response to an elevated prehospital INR. Their pre-plasma administration INR was 2.7 [1.6 – 4.0] and corrected to 2.3 [1.7 – 2.9] by the time they arrived at the emergency department. The four deaths were patients on Coumadin with intracranial hemorrhage. All of the trauma patients had ongoing need for transfusion of plasma and/or other blood products after admission. There was no thawed plasma wasted.

Conclusion: Our preliminary experience demonstrates the feasibility of pre-hospital plasma administration. Additionally, there were no wasted units of thawed plasma. The improvement in INR during transport was only modest, suggesting the need for increased units of thawed plasma on the helicopter transport and pharmacological adjuncts to treat coagulopathic trauma patients in the pre-hospital setting.

TRADITIONAL SYSTOLIC BLOOD PRESSURE TARGETS UNDERESTIMATE HYPOTENSION-INDUCED SECONDARY BRAIN INJURY

M Brenner, DM Stein, PF Hu, B Aarabi, K Sheth, TM Scalea
University of Maryland Shock Trauma Center

Presenter: M Brenner **Senior Sponsor: T Scalea**

Vital signs, particularly blood pressure, are often manipulated to maximize perfusion and optimize recovery from severe traumatic brain injury (sTBI). We investigated the utility of automated continuously recorded vital signs to predict outcomes following sTBI.

60 patients with head AIS≥3, age>14, “isolated” TBI and need for intracranial pressure (ICP) monitoring were prospectively enrolled at a single large urban tertiary care facility. Outcome was measured by mortality and Extended Glasgow Outcome Scale (GOSE) at 12 months. Continuous, automated, digital data was collected every 6 seconds for 72 hours after admission, and five minute means of systolic blood pressure (SBP) were recorded. We calculated SBP as pressure-times-time dose (PTD) to describe the cumulative amplitude and duration of episodes above and below clinical thresholds. The extent and duration of the insults were calculated as percent time (%time), PTD, and PTD per day (PTD/D) of defined thresholds (SBP<90, <100, <110 and <120, MAP<60 and <70, HR>100 and >120, SpO2 <88 and <92) for the first 12, 24, and 48 hours of ICU admission. We analyzed their ability to predict mortality and GOSE by receiver operator characteristics (ROC).

Mean age was 33.8 years (range 16-83), mean admission was GCS 6.4 ± 3, and mean head AIS 4.2 ± 0.72. The 30-day mortality rate was 13.3%. Of the 45 patients in whom GOSE at 12 months was available, 28 (62%) had good neurological outcomes (GOSE >4). Traditional markers of poor outcome (admission SBP, admission GCS, Marshall score) were no different between groups with good or poor outcome. PTD, PTD/D, and %time SBP<110 and SBP<120 predicted mortality at 12, 24, and 48 hours ($p<0.04$). Percent time SBP<110 in the first 24hrs was predictive of 12month GOSE ($p=0.02$). PTD/D SBP<120 in the first 24hrs, and PTD and PTD/D in the first 48hrs were also predictive of 12month GOSE ($p<0.05$).

Within the first 48 hours of ICU admission, hypotension was found to be predictive of mortality and functional outcomes at higher thresholds than traditionally defined. Systemic blood pressure targets closer to 120 mmHg may be more efficacious in minimizing secondary insults, and particularly useful in settings without invasive intracranial monitoring capabilities.

FAILURE TO REINSTITUTE STATIN THERAPY IN SEVERELY INJURED PATIENTS IS ASSOCIATED WITH AN INCREASED RISK IN DEVELOPMENT OF POST-INJURY ORGAN FAILURE

J Cuschieri, A Cheng, K Mandell, J Sterling, S Arbabi, G Jurkovich, RV Maier
University of Washington

Presenter: Joseph Cuschieri **Senior Sponsor: Gregory Jurkovich**

Background: Statins are effective lipid-lowering agents with pleiotropic effects include-ing anti-inflammatory properties and have been shown to reduce morbidity associated with acute bacterial infections. The effect of statins in acutely injured patients, however, is unclear. Recently, pre-injury statin use was shown to be associated with improved survival, while a subsequent multi-center prospective cohort study by us suggested that pre-injury statin use is associated with increased risk of post-injury multiple organ failure (MOF) without an improvement in survival. To examine these divergent views, we focused on statin use in the early post-injury period. We hypothesize that pre-injury statin use is protective; however, failure to reinstitute therapy in the acute post-injury period may actually be detrimental.

Methods: Data were obtained from a single center prospective cohort study evaluating clinical outcomes in bluntly injured adults with severe hemorrhagic shock. Patients with severe traumatic brain injury and not surviving greater than 48 hours were excluded. Pre-injury statin (PIS) and in-hospital reinstitution of a statin therapy within 48 hours were identified. Variables associated with the development of MOF, were placed in a stepwise multivariate logistic regression to identify independent predictors of MOF.

Results: In all, 796 patients were evaluated over 6 years. Eighty-nine (11.1%) of these patients were PIS. PIS patients were older and had higher BMIs than those who were not on statins. PIS use was not associated with any improvement in outcome, including a reduction in MOF, compared to patients not on statins. Among patients who were PIS, 31 (34.8%) were not restarted on their statin within 48 hours. These patients were found to have increased morbidity and mortality when compared to the 58 (65.1%) patients who were restarted on their statin early (Table). Step-wise logistic regression analysis demonstrated an adjusted odds for patients who were not restarted on statin therapy was 7.5 times more likely to be associated with the development of MOF than those patients who had their statin restarted (95% CI: 1.29-48.32).

Conclusion: Failure to reinstitute statin therapy early after injury in patients with pre-injury statin use is associated with an increased risk for post-injury MOF and mortality. Thus, patients with pre-injury statin use should be restarted on their statin soon after injury to avoid withdrawal associated morbidity and mortality.

	Statin Not Restarted	Statin Restarted	p value
Max MOF score	7.6 (0.3)	4.6 (0.4)	0.0001
MOF (%)	26	6	0.0001
Nosocomial Infection	18	16	0.3409
ICU LOS	18.8 (3.7)	12.9 (2.0)	0.1394
HOS LOS	33.7 (5.3)	27.0 (3.6)	0.3013
Ventilator Days	16.5 (3.5)	8.4 (1.5)	0.0198
Mortality	11	5	0.0073

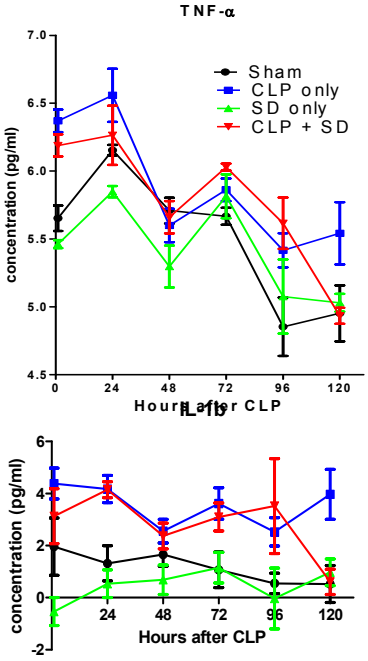
SLEEP DEPRIVATION AFTER SEPTIC INSULT TRUNCATES PRO-INFLAMMATORY CYTOKINE RELEASE IN A MURINE MODEL

R Friese, J Bender, TS O'Keeffe, BA Joseph, JL Wynne, N Kulvatunyou, A Tang, R Latifi, P Rhee
University of Arizona College of Medicine

Presenter: Randall S. Friese **Senior Sponsor: Randall S. Friese**

Background: Several cytokines are known to be involved in sleep regulation. In particular, the pro-inflammatory cytokines IL-1b and TNF-□ are somnogenic in rodents. Additionally, rodent models have demonstrated increased mortality when sleep deprivation (SD) is coupled with septic insult. The effect of SD on circulating cytokine profiles has not been previously described. The purpose of our study was to explore cytokine profiles after septic insult with and without SD.

Methods: C57BL/6J male mice were sacrificed at one hour and 1-5 days after cecal ligation and puncture (CLP only), sham, SD alone (SD only), or CLP followed by 48 hours of SD (CLP+SD). SD was achieved by securing animal housing to an orbital shaker set to repeatedly cycle at 120 RPM over 120 seconds (30 on/90 off). This method has been previously validated using electroencephalography. Sham animals underwent laparotomy and cecal manipulation without puncture or ligation. SD only animals did not undergo septic insult (CLP). Plasma cytokine concentrations were determined using conventional ELISA techniques for all time points and at baseline (no interventions). Two-way ANOVA was utilized to explore for within (time) and between group differences. Prior to analysis all cytokine measurements were natural log transformed for normality assumptions.



Results: IL-1b levels did not change over time within any group (p=0.326). However, TNF-□ levels decreased over time (p<0.001). CLP and CLP+SD increased circulating cytokines above sham levels. There were no differences in TNF-□ levels after septic insult with or without SD at any time point. At day 5, IL-1b was decreased for CLP+SD compared to CLP only.

Conclusions: Septic insult and septic insult coupled with SD increased circulating cytokine levels. Additionally, animals undergoing CLP alone had a sustained inflammatory response at 5 days compared to those undergoing CLP+SD. SD coupled with a septic insult may inhibit pro-inflammatory cytokine release resulting in increased risk of mortality.

2-YEAR EXPERIENCE OF PIGTAIL CATHETER IN THE MANAGEMENT OF TRAUMATIC PNEUMOTHORAX: A CHANGING TREND

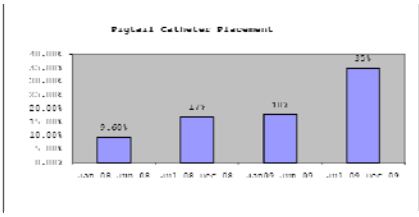
N Kulvatunyou, R Friese, B Joseph, R Latifi, T O'Keefe, J Wynne, P Rhee
University of Arizona

Presenter: N Kulvatunyou **Senior Sponsor: P Rhee**

Background: Conventional treatment of traumatic hemo-pneumothorax (HPTX) is chest tube thoracostomy (CT). The pigtail catheter (PC) is smaller, less invasive, and has worked well in patients with a non-traumatic pneumothorax (PTX). We review our early experiences of using PC.

Methods: We retrospectively reviewed the chart of trauma patients over our last 2-year period (2008-2009) at a Level 1 trauma center that required CT or PC placement for HPTX. The PCs were 14F Cook catheters placed over a guide-wire with an introducer and were placed by the trauma team. We excluded CT/PC that was placed during an emergency resuscitation or after thoracotomy. Subgroup analysis is performed for CT/PC placed for PTX.

Results: Of 9,624 trauma patients evaluated, 97 were treated with PC and 369 with CT. Our PC placement has increased over time (graph). Eighty percent of PC was placed for PTX, comparing to 39% for CT. The failure rate, defined as an additional tube placement is comparable between CT and PC (12% vs. 16%, p=.27). Similarly, PC has a higher insertion- related complication rate than CT but it is not statistically significant (4% vs. 2%, p=.12). Subgroup analysis for PC/CT placed for PTX has a similar outcome (table).



Conclusion: We report our increased use of PC in the acute trauma setting. Main indication during this experience is for PTX. When compared to CT, PC placed for PTX has a similar outcome. There is a learning curve for placing PC. A future prospective study is warranted to determine PC's indications and role as PC is less invasive and associated with less pain

	PC-PTX (79)	CT-PTX(190)	P-value
Age	43+21	40+18	0.18
Sex (M:F)	1.9:1	3.4:1	0.046
Blunt (%)	82	84	0.74
Injury severity Score (ISS)	17 + 11	21 + 13	0.14
Tube duration (days), median	4(3,5)	4 (3,6)	0.09
Ventilator day, median	0(0,4)	0 (0,3)	0.37
ICU day (median)	1(0,5)	1(0,6)	0.59
Mortality (%)	10	9	0.75

DISTRACTED DRIVER PROGRAM AT A LEVEL ONE TRAUMA CENTER

T Rives, S Enriquez, R Gandhi, C Hecht
JPS Hospital (Tarrant County Hospital District)

Presenter: Terry E. Rives **Senior Sponsor: Roxie Albrecht**

Background: The National Safety Council estimates that at least 1.6 million crashes are caused each year by drivers using cell phones or texting. Strayer, et al., reported in 2006 that after controlling for driving conditions and time on task, the impairments associated with using a cell phone while driving can be as profound as those associated with driving while drunk. We wanted to test if this behavior can be reduced with driver simulation education

Methods: In 2010, the Trauma Services Department initiated a Don't Drive Distracted (3D) awareness program in the local urban community. The program uses among other teaching modalities a driving simulator to demonstrate the impact of distracted driving. Each participant experiencing the driving simulator completed a brief questionnaire regarding their current driving habits prior to driving the simulator. Upon completion, each participant was asked to complete a questionnaire regarding anticipated changes, if any, in their driving habits.

Results: The following results are for the first two sessions of what is expected to be series of education and driver simulation opportunities. Seventy-two percent (n=26) of pre-simulator "drivers" reported using a telephone while driving. After the driving simulator experience seventy-seven percent (n=24) reported they would not use the telephone while driving (p-value=<0.01). In our cohort, fifty percent of the pre-simulator drivers reported they currently text while driving. Of the same group, after their simulator driving experience only one person reported they will continue to text while driving (p-value=<0.01).

Pre Simulator Distraction	**Post-Simulator n**	**n**	**P-value**
Telephone	**26 (72%)**	**7 (23%)**	**<0.01**
Texting	**18 (50%)**	**1 (3%)**	**<0.01**

Conclusion: Albeit, a relatively small pilot sample, we believe the results are relevant and important enough to report at this time. Distracted driving is preventable. A driver simulation program may convince people to not drive distracted.

THERAPEUTIC HYPOTHERMIA FOR CARDIOPULMONARY ARREST IN AN AVALANCHE BURIAL VICTIM

E Moore, EL Hirshberg, MD Rollins, CK Grissom
University of Utah, Intermountain Healthcare

Presenter: Evan Moore **Senior Sponsor: Mark Stevens**

A 12 year old male was brought to a level 1 pediatric trauma center after pre-hospital resuscitation from cardiopulmonary arrest secondary to avalanche burial while skiing inbounds at a local ski area without an avalanche transceiver. The patient was wearing a helmet and was buried for approximately 30-40 minutes. He was in cardiac arrest after extrication by ski-patrol and bystanders. He received 5 minutes of CPR with return of spontaneous circulation and was transported by helicopter to a level 1 pediatric trauma center. On arrival to the trauma bay the patient's temperature was 29 degrees Celsius by foley catheter, he was moaning, had "upper extremity tonic contractions", with a GCS report of 9 (E4, V2, M3). Initial venous blood gas was significant for a pH of 6.9, partial pressure of carbon dioxide of 82 mm Hg, partial pressure of oxygen of 30 mm Hg, bicarbonate 16 meq/l, and base deficit of 19. The patient was intubated. Head CT was negative and abdomen/pelvis CT was consistent with shock bowel and shock liver. Patient was admitted to the pediatric intensive care unit where a decision was made to treat him with therapeutic hypothermia for neuroprotection. Active rewarming was stopped and the patient was passively rewarmed to goal temperatures of 32-34 degrees Celsius which was then maintained for 24 hours. The patient was extubated post-trauma day #2 asking for his ski pass and was discharged post-trauma day #3. Within one month, patient had returned to his normal activities. He complained of persistent bilateral hand weakness and followed up with outpatient neurology. Two months after his arrest, an MRI of the brain showed a 6x4 mm lacunar infarct consistent with a vascular insult but otherwise no evidence of ischemic damage. This case illustrates the possible benefit of therapeutic hypothermia after cardiac arrest due to asphyxiation as would have occurred during avalanche burial. The patient did not experience hemorrhagic or arrythmogenic complications in association with his therapeutic hypothermia. Return of spontaneous circulation after cardiopulmonary resuscitation is uncommon in the pre-hospital environment after avalanche burial. The positive neurological outcome noted in this patient underscores the importance of full resuscitation efforts in the setting of environmental hypothermia and the potential neurological benefits of therapeutic hypothermia after cardiopulmonary arrest due to asphyxiation.

WESTWARD EXPANSION OF THE UNITED STATES AND THE RAILWAY SURGEON: THE EARLY DEVELOPMENT OF A HIGHLY-ORGANIZED TRAUMA SYSTEM

Clyde E. McAuley
Altoona Regional Health System

Presenter: C McAuley **Senior Sponsor: C McAuley**

The 1869 completion of the initial phase of the Transcontinental Railroad at Promontory Summit, Utah Territory, enabled the subsequent massive migration of settlers to remote areas of the American West. Over the next several decades, the ongoing expansion of the railroad system was associated with remarkable risks for railroad passengers, railroad workers, railway men and townspeople alike. In 1890 alone, there were over 6300 railroad fatalities, and the per annum risk for either death (1%) or major injury (10%) was staggering for railway men.

Recognizing the need to care for the injured, an organized specialty of medical care was developed in the early 1880s, sponsored by the railroad industry and led by a cadre of full-time chief surgeons. Ultimately, the system would employ thousands of railway surgeons, build dozens of specialized hospitals throughout the West, develop first-responder and first-aid capabilities, and develop such innovations as mobile railcar operating rooms. The railway surgeon would also play a pivotal role in the development of the nation's first "hospital plan", guaranteeing an all-inclusive healthcare system for railway employees and those injured in railroad accidents.

The history of the early Western railway surgery system provides important insights in the development and delivery of our present system of care for the injured.

BY-LAWS

BYLAWS OF THE
WESTERN TRAUMA ASSOCIATION

ARTICLE I
Name, Objectives, Organization, and Jurisdiction

SECTION 1: Name
The name of this organization is the Western Trauma Association, henceforth referred to as the Association.

SECTION 2: Objectives, Core Value and Mission Statement
1) Objectives to promote the exchange of educational and scientific information and principles, at the highest level, in the diagnosis and management of traumatic conditions and to advance the science and art of medicine.

2) Core value:
Continuing education by participation in a diverse, multi-disciplinary scientific program with the goal of improving the care of injured patients.

3) Mission Statement:
The Western Trauma Association is committed to the improvement of trauma care through research, education, sharing of clinical experiences and the development of physicians of all specialties who are involved in the care of trauma patients.

SECTION 3: Organization
This is a non-profit membership corporation entity, duly incorporated on the 25th day of January 1971 under, and by virtue of, the provisions of the laws of the State of Colorado. The Association received a final determination of its 501(c)(3) status in October 2002.

SECTION 4: Jurisdiction and Territory
The territory in which this Association shall act will be the United States of America. It shall not be constrained, however, from holding its annual meetings at any designated site.

SECTION 5: Governing Board
The affairs of the Association shall be conducted by the Board of Directors.

ARTICLE II
Membership

SECTION 1: Membership Limitation
Membership shall be limited 125 active members. No single specialty shall comprise more than 40% of this total membership of 125.

SECTION 2: Membership and Qualifications

A. Active members shall be limited to Doctors of Medicine or Doctors of Osteopathy who are Board Certified in their particular medical specialty and are under the age of 55 years. The Board of Directors is hereby given discretionary powers to interpret if foreign physicians who apply for membership have credentials comparable to Board Certification. Active status is conferred by a two-thirds vote of the Board of Directors. Active members have the right to vote on any business presented to the organization during the business meeting, serve on, or chair any committee and be elected to any elected position within the organization.

B. Associate members include qualified members of other (non-M.D.) health care disciplines with a special interest or expertise in trauma. Approval of a majority of the Board of Directors is required. Associate members must satisfy the same requirements for election to and retention of membership as active members. Associate members may not vote, serve on committees or hold office.

C. Senior membership is automatically conferred on all members in good standing upon reaching the age of 55, assuming the member is in good standing. A senior member retains all voting privileges and rights of active members, and must pay dues annually but is exempt from attendance requirements. The senior member is not counted as part of a given specialty's membership quota or membership total.

D. Retired membership: Members in good standing who retire from practice are, upon notification of the Secretary and/or Treasurer, entitled to continued membership, but are exempt from all membership requirements, including the payment of dues. They shall not have the right to vote and their membership shall not be counted towards specialty or membership quotas. The change to “retired status” is voluntary.

E. Emeritus membership: Senior members of the Association who have made a significant contribution to the organization may be awarded Emeritus membership by a majority vote of the Board of Directors.

F. Candidates for membership must submit a completed application and a letter of support (sponsorship) from a member of the Association. They must also submit an abstract for consideration by the Program Committee. A prospective member must attend a meeting within three (3) years prior to the meeting in which he/she is voted on for membership.

SECTION 3: Membership Retention
To retain membership in the Association, each member must comply with the following:

A) Be a physician in good standing before his or her professional specialty board.

B) Attend at least one out of every three consecutive meetings of the Association.

C) Agree to be responsible for annual membership dues and any assessments as set by the Board of Directors at a special meeting or the annual meeting. He/she must remain current in the payment of dues and assessments.

D) Maintain behavior befitting a physician by adhering to the code of ethical and moral standards as described by either the American College of Surgeons or the American Medical Association.

SECTION 4: Termination of Membership
A) Membership can be terminated for a violation of one or more of the items set forth in Article II, Section 3 of the Bylaws of the Association by a vote of two-thirds of the Board of Directors.

B) Any member may resign by filing a written resignation with the Secretary; however, such resignation shall not relieve the member so resigning of the obligation to pay any dues or other charges accrued and unpaid.

ARTICLE III
Meetings

SECTION 1: Annual Meetings
There shall be an annual meeting of the membership of the Association held in some suitable location chosen by the President-elect and approved by a majority vote of the Board of Directors and the membership. Funds shall be made available for the conduct of the scientific program at the annual meeting.

SECTION 2: Special Meetings
Special meetings of the Association may be called by the Board of Directors or two-thirds of the members in good standing, entitled to vote. The location for a special meeting of the Association shall be chosen by the Board of Directors.

SECTION 3: Notice
Notice of the time and place of the annual or special meetings of the Association shall be mailed by the secretary of the Association to each and every member at his address as it last appears on the records of the Association with postage thereon prepaid. Notice shall be deemed delivered when deposited in the United States Mail, so addressed to the respective member. Notification by electronic mail (e-mail) may be substituted for regular mail.

SECTION 4: Quorum
Subject to provisions of Article VI, Section 3, one-fourth of the membership present at any meeting of the Association shall constitute a quorum.

ARTICLE IV
Board of Directors, Meetings, and Responsibilities

SECTION 1: Composition

A. The President, President-elect, Vice- President, Secretary, Treasurer, immediate Past President, program committee chairman and six members-at-large shall constitute the Board of Directors.

B. The President of the Association shall serve as Chairman of the Board of Directors. The Chair of the Multicenter Trials Committee, the Historian and the President of the Western Trauma Foundation for Education and Research shall serve as ex-officio members of the Board of Directors. The ex-officio members shall not have any vote on matters before the board.

C. At each annual meeting, two members of the Association in good standing named by the Nominating Committee and elected by the membership, shall replace the two outgoing members-at-large of the Board unless the membership should, by majority vote, elect to retain the then existing at-large Directors.

D. The tenure of elected members of the Board of Directors shall be for no more than three years unless such member shall be elected to a position as an officer in the Association.

Section 2: Annual Meetings

A. The annual meeting of the Board of Directors shall be held during and in the same general location as the annual meeting of the Association, but at least one day in advance of the general business meeting. The agenda will be determined by the President of the Association who will preside at the meeting. Additional agenda items may be proposed for discussion and/or vote by any Board member.

B. Unless otherwise determined by a majority vote of the Directors, all meetings of the Board of Directors shall be considered executive sessions and, thus, closed to all but Board Members and invited guests.

SECTION 3: Special Meetings

A. Special meetings of the Board of Directors may be held at any time and place upon the call of the President, or a majority of the Board providing ten days prior written notice shall be given to each Director, stating the time, place and purpose of the special meeting. Notices of special meetings shall be mailed to the Directors by the Secretary of the Association in the same form and manner as provided above for mailing notices of meetings for the general membership of the Association.

B. In lieu of special meetings, the Board of Directors may conduct business by conference telephone call including a quorum of Members of the Board. The same rules for notification of special meetings shall apply to conference calls.

SECTION 4: Quorum

A majority of the Board of Directors shall constitute a quorum. (No member of the Board may vote by proxy.)

SECTION 5: Powers

Subject only to the limitations of the provisions of the Colorado Nonprofit Corporation Act, all corporate powers shall be exercised by or under the authority of, and the affairs and activities of the Association shall be controlled by, or under the authority of, the Board of Directors.

Section 6: Ex-officio Members of Board of Directors.

The President of the Western Trauma Foundation for Education and Research, Chairman of the Program Committee, Chair of the Multicenter Trials Committee and the Historian shall be ex-officio members of the Board of Directors and may participate in any meeting of the Board of Directors.

ARTICLE V
Registration, Fees, Dues, and Assessments

SECTION 1: Registration Fees

Registration fees for annual meetings shall be paid and used to defray the cost of the functions of the annual meeting. The amount of the registration fee shall be determined by the President, in consultation with the Treasurer, and notice thereof shall be sent to the membership along with the written notice of the annual meeting.

SECTION 2: Dues

Dues of the Association shall be set by the Board of Directors. Each member shall pay dues to the Treasurer of the Association for each fiscal year, beginning with the first new fiscal year after election to membership. The Treasurer shall notify each member of his/her dues obligation during the first quarter of the fiscal year by regular or electronic mail. This notification shall follow the rules for notification of the annual meeting. Associate members shall be required to pay the same dues required of active members. Failure to pay dues for three (3) years shall be considered cause for termination of membership.

SECTION 3: Assessments

A two-thirds majority vote of the Board of Directors of the Association can institute a special assessment of the general membership. Special assessments can be voted by the Board of Directors only for the promotion of scientific programs at the annual meetings, research papers or other purposes designed to achieve the exchange of ideas and principles pertaining to the diagnosis and management of traumatic injuries and conditions. Notice of any special assessment of the membership so voted by the Board of Directors shall be sent, by either regular or electronic mail, to all active and senior members at the last address on record with the Association, postage pre-paid.

SECTION 4: Waiver of Dues and Responsibilities
All requirements for retention of membership including payment of dues and attendance at meetings may be waived by a vote of the majority of the Board of Directors upon petition. Eligibility for such waivers shall include induction into the Armed Forces of the United States on a temporary basis, physical disability, or other reasons that would place unreasonable hardship, physical disability, or other reason upon the petitioner.

ARTICLE VI
Voting

SECTION 1: Voting Rights
Each active member or senior member in good standing shall be entitled to one vote on each matter submitted to a vote of the membership.

SECTION 2: Majority
A majority of the votes entitled to be cast on a matter at a meeting at which a quorum is present shall be deemed necessary for the adoption of such matters unless otherwise noted in the Bylaws.

SECTION 3: Manner of Voting
Each member of the Association is entitled to vote in one of three following manners:

1) In person.

2) With respect to matters described in any notice of meeting, by written instruction or ballot, delivered by United States Mail, postage pre-paid, addressed to the secretary of the Association at the Association's registered office or such other address as specified in any notice of meeting, postmarked and received on or before the date of the meeting of the membership where the vote is to be taken. A member who has voted by such written instruction or ballot shall be counted for purposes of determining whether quorum of members is present at a meeting, but only with respect to the matter voted upon by such Member.

3) By proxy duly executed in writing by the member or his authorized attorney-in-fact. No voting member in attendance at a meeting shall hold or vote more than one duly executed proxy for absent members.

SECTION 4: Amendments
As to the Articles of Incorporation, consolidation or dissolution of the Association shall be passed only in the event of a two-thirds vote of the members in good standing.

SECTION 5: Elections
Elections and all other matters raised to a vote of the membership cannot be held unless a quorum is present and shall be by majority vote.

ARTICLE VII
Officers

SECTION 1: Officers
The officers of the Association shall consist of the President, President-Elect, Vice-President, Secretary, Treasurer, Historian, and such other officers as from time to time may be appointed by the Board of Directors. The President, President-Elect, Vice-President, Secretary, Historian, and Treasurer shall be elected at the annual meeting of the members by simple majority of a quorum.

SECTION 2: Terms and Vacancies
The President, President-Elect, and Vice-President shall hold office for one (1) year. The Secretary and Treasurer shall each hold office for the term of three years. All elected officers, except the Treasurer, shall be automatically inaugurated at the close of the annual meeting at which they are elected. The newly elected treasurer shall assume the responsibilities of his/her office at the beginning of the next fiscal year following his/her election. The Historian shall serve until his/her death, resignation or inability to perform the duties subsequently described in Article VIII, Section 6. If an officer cannot complete his/her term, his/her successor shall be chosen by the Board of Directors by special meeting to fill the vacancy for the unexpired term of the office. No officer shall serve more than one term.

SECTION 3: Removal
Any officer may be removed, with or without cause, by a vote of a majority of the members of the Board of Directors present at any meeting for that purpose.

SECTION 4: Resignation
Any officer may resign at any time by giving written notice to the Board of Directors and receiving their approval.

ARTICLE VIII
Duties and Authority of Officers

SECTION 1: President
The President shall preside at all meetings of the members and shall serve as ex-officio member of all committees. The president shall be Chairman of the Board of Directors and shall serve as the liaison to the American Association for the Surgery of Trauma.

SECTION 2: President-Elect
The president-elect shall plan and organize the next annual meeting and assume whatever responsibilities the president or Board of Directors shall assign.

SECTION 3: Vice President
The vice president shall preside at all business meetings in the absence of the president. The Vice-President shall serve as Chair of the Website Committee and perform such other duties as requested and assigned by the President or the Board of Directors.

SECTION 4: Secretary
The secretary shall
1) Keep the minutes of all meetings of the association and the Board of Directors
2) Be responsible for applications for membership, elections and terminations of members and communications to the membership, especially those whose membership is in jeopardy because of violations of the bylaws.
3) Maintain the Membership database, with the help of the Treasurer.
4) Record the reports from the other officers and committees and any bylaw changes.
5) Maintain copies of all corporate documents, including contracts, except for those that specifically relate to financial matters.
6) Prepare a report for the membership at the annual business meeting and for the Board of Directors at each of their annual meetings.

SECTION 5: Treasurer
The treasurer shall:
1) Keep the books of account of the Association.
2) Have custody of, and be responsible for all funds, securities, financial documents, and other properties of the Association and shall deposit all such funds in the name of the Association in such banks or other depositories as shall be approved by the Board of Directors.
3) Assist the Secretary in keeping the roster of the membership that is current and accurate.
4) Engage a certified public accountant, approved by the President, to prepare such tax documents as are required by law and file said documents in a timely manner. He/she will require said certified public accountant to audit the books of the Association upon the request of the Board of Directors and present the report of that audit to the Board.
5) Manage all accounts receivable and payable, including such expenses as may be incurred in the name of the Association.
6) Send to all active and associate members a statement of dues in the first quarter of the fiscal year, and make all necessary efforts to collect those dues.
7) Serve on the Website Committee and prepare the website annually for the meeting registration process.
8) Prepare registration packets, including name badges, and other items, for all those attending the annual meeting.
9) Organize, with assistance from the other Officers and Board Members, the registration process at the annual meeting.

SECTION 6. Historian
The Historian should maintain and safeguard the archives of the Association. The Historian shall be an ex-officio member of the Board of Directors. In case of a vacancy by reason of death, resignation, or inability to fulfill the responsibilities of the office, the vacancy may be filled by the Board of Directors until the next annual meeting of the members. The historian shall keep a continuous account of the history of the Association for the use of the membership. This shall include significant information concerning each annual meeting, including the site of the meeting, recipients of honors, invited lecturers, highlights of the scientific program, and important actions arising from the Business Meeting. The historian shall also record significant action of the Board of Directors at its meeting. Each five years the historian shall prepare the history of the Association from the time of the last recorded history to be part of the archives of the Association. Memorabilia of the Association shall be retained by the Historian.

ARTICLE IX
Committees

SECTION 1: Nominating Committee
The Nominating Committee shall be composed of three (3) members of the Association appointed by the President. These individuals should represent General Surgery, Orthopedic Surgery, and another specialty. The Chairman of this Committee shall be the immediate Past President. This committee shall submit a slate of nominees for the various offices of the Association to the annual meeting of the members.

SECTION 2: Program Committee

The Program Committee shall consist of a Chairman, appointed by the President, and a Committee including at least one General Surgeon, one Orthopedic Surgeon, another specialist (if available), and as many other members as the Program Chairman and President deem necessary to a maximum of ten (10) members. The Chair and the President will appoint the committee members. The President and the Chairman of the Publications Committee shall serve as ex-officio members. The Chairman will serve a two year term and is an ex-officio member of the Board of Directors. This Committee will be responsible for the organization and conduct of the program at the annual meeting.

SECTION 3: Membership Committee
The Secretary of the Association shall serve as Chairman of the Membership Committee. The secretary shall present to the Board of Directors at its annual meeting, a list of candidates who have satisfied the requirements for membership. Upon approval of the Board of Directors, this group shall be then presented to the membership for its approval as previously outlined.

SECTION 4: Publications Committee
The Publications Committee will consist of a Chairman and a Committee including at least one General Surgeon, one Orthopedic Surgeon, one Plastic Surgeon and another specialist (if available), and as many other members as the Chairman and President deem necessary and appropriate. The Chairman of the Program Committee shall serve as an ex-officio member of the committee. The Chairman of the Publications Committee will be appointed by the President and serve a two (2) year term. The other members, selected from the membership, will be appointed by the President in consultation with the Chairman, annually. This committee will be responsible for reviewing all manuscripts submitted in association with presentations at the annual meeting and for choosing those which will be submitted to The Journal of Trauma. The Chairman will serve as the liaison to The Journal of Trauma. Should the Chairman not be an Editorial Consultant to The Journal of Trauma, the Chairman will consult with a member of the Editorial Board of The Journal of Trauma designated by the President.

Section 5: Multicenter Trials Committee
The multicenters trial committee shall consist of a Chairman and other interested members of the association. This committee will be responsible for coordinating and reviewing all the multicenter trials conducted under the aegis of the association. The Chairman will be appointed by the President to a five (5) year term. The Chairman will report to the president and board of directors, and at the annual business meeting and serve as an ex-officio member of the Board of Directors.

Section 6: Website Committee
The Website Committee shall consist of a Chairman and four (4) members. The Vice President shall serve as the Chairman of the Committee. The Treasurer will serve as a member. The two other members, selected from among the Association membership, will be appointed by the Vice President for a two (2) year term. The Committee shall be responsible for development and maintenance of the Association's Website.

Section 7: Other Committees
Other ad hoc committees may be established by the Board of Directors. The creation of additional standing committees, proposed by the Board of Directors, requires the approval of a majority of members in good standing.

ARTICLE X
Conduct and Order of Business

SECTION 1: Business Sessions of the Members
There shall be an annual business meeting of the members during the annual meeting. It shall be preceded by a meeting of the Board of Directors also held during the annual meeting of the Association.

SECTION 2: Order of Business
The President shall set the agenda and where possible should follow Robert's Rules of Order.

ARTICLE XI
Indemnification

Section 1. Definitions. For purposes of this Article:

A. The terms "director or officer" shall include a person who, while serving as a director or officer of the Association, is or was serving at the request of the Association as a director, officer, partner, member, manager, trustee, employee, fiduciary or agent of another foreign or domestic Association. The term "director or officer" shall also include the estate or personal representative of a director or officer, unless the context otherwise requires.

B. The term "proceeding" shall mean any threatened, pending, or completed action, suit, or proceeding, whether civil, criminal, administrative, or investigative, whether formal or informal, any appeal in such an action, suit, or proceeding, and any inquiry or investigation that could lead to such an action, suit, or proceeding.

C. The term "party" includes an individual who is, was, or is threatened to be made a named defendant or respondent in a proceeding.

D. The term "liability" shall mean any obligation to pay a judgment, settlement, penalty, fine or reasonable expense incurred with respect to a proceeding.

E. When used with respect to a director, the phrase "official capacity" shall mean the office of director in the Association, and, when used with respect to a person other than a director, shall mean the office in the Association held by the officer or the employment, fiduciary or agency relationship undertaken by the employee or agent on behalf of the Association, but in neither case shall include service for any foreign or domestic Association or for any other person.

Section 2 General Provisions.
The Association shall indemnify any person who is or was a party or is threatened to be made a party to any proceeding by reason of the fact that such person is or was a director or officer of the Association, against expenses (including attorneys, fees), liability, judgments, fines, and amounts paid in settlement actually and reasonably incurred by such person in connection with such proceeding if such person:

(i) acted in good faith;
(ii) reasonably believed, in the case of conduct in an official capacity with the Association, that the conduct was in the best interests of the Association, and, in all other cases, that the conduct was at least not opposed to the best interests of the Association; and
(iii) with respect to any criminal proceeding, had no reasonable cause to believe that the conduct was unlawful.

However, no person shall be entitled to indemnification under this Section 2 either:

(i) in connection with a proceeding brought by or in the right of the Association in which the director or officer was adjudged liable to the Association; or
(ii) in connection with any other proceeding charging improper personal benefit to the director or officer, whether or not involving action in that person's official capacity, in which the officer or director is ultimately adjudged liable on the basis that the director or officer improperly received personal benefit.

Indemnification under this Section 2 in connection with a proceeding brought by or in the right of the Association shall be limited to reasonable expenses incurred in connection with the proceeding. The termination of any action, suit, or proceeding by judgment, order, settlement, or conviction or upon a plea of solo contender or its equivalent shall not of itself be determinative that the person did not meet the standard of conduct set forth in this Section 2.

Section 3 Successful Defense on the Merits; Expenses.
To the extent that a director or officer of the Association has been wholly successful on the merits in defense of any proceeding to which he was a party, such person shall be indemnified against reasonable expenses (including attorneys' fees) actually and reasonably incurred in connection with such proceeding.

Section 4 Determination of Right to Indemnification.
Any indemnification under Section 2 of this Article (unless ordered by a court) shall be made by the Association only as authorized in each specific case upon a determination that indemnification of the director or officer is permissible under the circumstances because such person met the applicable standard of conduct set forth in Section 2. Such determination shall be made:

(i) by the Board of Directors by a majority vote of a quorum of disinterested directors who at the time of the vote are not, were not, and are not threatened to be made parties to the proceeding; or
(ii) if such a quorum of the Board of Directors cannot be obtained, or even if such a quorum is obtained, but such quorum so directs, then by independent legal counsel selected by the Board of Directors in accordance with the preceding procedures, or by the voting members (other than the voting members who are directors and are, at the time, seeking indemnification). Authorization of indemnification and evaluation as to the reasonableness of expenses shall be made in the same manner as the determination that indemnification is permissible, except that, if the determination that indemnification is permissible is made by independent legal counsel, authorization of indemnification and evaluation of legal expenses shall be made by the body that selected such counsel.

Section 5. Advance Payment of Expenses; Undertaking to Repay.
The Association may pay for or reimburse the reasonable expenses (including attorneys, fees) incurred by a director or officer who is a party to proceeding in advance of the final disposition of the proceeding if:

(i) the director or officer furnishes the Association a written affirmation of the director's or officer's good faith belief that the person has met the standard of conduct set forth in Section 2;
(ii) the director or officer furnishes the Association with a written undertaking, executed personally or on the director's or officer's behalf, to repay the advance if it is determined that the person did not meet the standard of conduct set forth in Section 2, which undertaking shall be an unlimited general obligation of the director or officer but which need not be secured and which may be accepted without reference to financial ability to make repayment; and
(iii) a determination is made by the body authorizing indemnification that the facts then known to such body would not preclude indemnification.

Section 6. Reports to Members.

In the event that the Association indemnifies, or advances the expenses of, a director or officer in accordance with this Article in connection with a proceeding by or on behalf of the Association, a report of that fact shall be made in writing to the member with or before the delivery of the notice of the next meeting of the members.

Section 7. Other Employees and Agents.
The Association shall indemnify such other employees and agents of the Association to the same extent and in the same manner as is provided above in Section 2 with respect to directors and officers, by adopting a resolution by a majority of the members of the Board of Directors specifically identifying by name or by position the employees or agents entitled to indemnification.

Section 8. Insurance.
The Board of Directors may exercise the Association's power to purchase and maintain insurance (including without limitation insurance for legal expenses and costs incurred in connection with defending any claim, proceeding, or lawsuit) on behalf of any person who is or was a director, officer, employee, fiduciary, agent or was serving as a director, officer, partner, member, trustee, employee, fiduciary of another domestic or foreign corporation, nonprofit corporation against any liability asserted against the person or incurred by the person in any such capacity or arising out of the person's status as such, whether or not the Association would have the power to indemnify that person against such liability under the provisions of this Article.

Section 9. Nonexclusivity of Article.
The indemnification provided by this Article shall not be deemed exclusive of any other rights and procedures to which one indemnified may be entitled under the Articles of Incorporation, any bylaw, agreement, resolution of disinterested directors, or otherwise, both as to action in such person's official capacity and as to action in another capacity while holding such office, and shall continue as to a person who has ceased to be a director or officer, and shall inure to the benefit of such person's heirs, executors, and administrators.

Section 10. Notice to Voting Members of Indemnification.
If the Association indemnifies or advances expenses to a director or an officer, the Association shall give written notice of the indemnification in advance to the voting members with or before the notice of the next voting members' meeting. If the next voting member action is taken without a meeting, such notice shall be given to the voting members at or before the time the first voting member sign a writing consenting to such action.

ARTICLE XII
Conflicts Of Interest, Loans And Private Inurement

Section 1. Conflicts of Interest.
If any person who is a director or officer of the Association is aware that the Association may or is about to enter into any business transaction directly or indirectly with himself, any member of such person's family, or any entity in which he has any legal, equitable or fiduciary interest or position, including without limitation as a director, officer, shareholder, partner, beneficiary or trustee, such person shall:

(a) immediately inform those charged with approving the transaction on behalf of the Association of such person's interest or position;

(b) aid the persons charged with making the decision by disclosing any material facts within such person's knowledge that bear on the advisability of such transaction from the standpoint of the Association; and

(c) not be entitled to vote on the decision to enter into such transaction.

Voting on such transaction shall be conducted as follows:

(i) Discussion of the matter, with the interested officer or director, shall be held by the board with such person present to provide information and answer any questions.

(ii) The interested office or director shall withdraw from the meeting.

(iii) Discussion of the matter outside of the presence of the interested officer or director shall be held by the Board.

(iv) The remaining members of the Board shall vote. Such voting shall be by written ballot. Such ballots shall not reflect the name or identity of the person voting.

Section 2. Loans to Directors and Officers Prohibited.
No loans shall be made by the Association to any of its directors or officers. Any director or officer who assents to or participates in the making of any such loan shall be liable to the Association for the amount of such loan until it is repaid.

Section 3. No Private Inurement.
The Association is not organized for profit and is to be operated exclusively for the promotion of social welfare in accordance with the purposes stated in the Association's articles of incorporation. The net earnings of the Association shall be devoted exclusively to charitable and educational purposes and shall not inure to the benefit of any private individual. No director or person from whom the

Association may receive any property or funds shall receive or shall be entitled to receive any pecuniary profit from the operation thereof, and in no event shall any part of the funds or assets of the Association be paid as salary or compensation to, or distributed to, or inure to the benefit of any member of the board of directors; provided, however, that:

(a) reasonable compensation may be paid to any director while acting as an agent, contractor, or employee of the Association for services rendered in effecting one or more of the purposes of the Association;

(b) any director may, from time to time, be reimbursed for such director's actual and reasonable expenses incurred in connection with the administration of the affairs of the Association; and

(c) the Association may, by resolution of the board of directors, make distributions to persons from whom the Association has received contributions previously made to support its activities to the extent such distributions represent no more than a return of all or a part of the contributor's contributions.

ARTICLE XIII
Amendments

These Bylaws may be amended at any annual meeting of the Association provided that a notice stating the purpose of each proposed amendment and the reason therefore, and a copy of the proposed amendment is sent to every member in good standing not less than thirty (30) days prior to the date of the meeting at which the proposed amendment is to be voted upon. It shall require a two-thirds vote of a quorum of the membership present at the meeting to amend a Bylaw.