

FORTIETH ANNUAL MEETING



February 28 – March 7, 2010

Telluride, Colorado

Accreditation Statement

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

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American College of Surgeons
Division of Education

WESTERN TRAUMA ASSOCIATION
40TH Annual Meeting
Telluride, Colorado
February 28- March 7, 2010

Speaker Disclosure Information

		Karmy-Jones, R	Nothing to disclose
Alam, HB	Nothing to disclose	Leone, RJ	Nothing to disclose
Baillie, D	Nothing to disclose	Long, W	Nothing to disclose
Ball, C	Nothing to disclose	Madigan, B	Nothing to disclose
Barmparas, G	Nothing to disclose	Malhotra, A	Nothing to disclose
Berry, S	Nothing to disclose	Moore, E	Nothing to disclose
Brown, C	Nothing to disclose	Mooty, RC	Nothing to disclose
Brown, J	Nothing to disclose	Morrison, C	Nothing to disclose
Burlew, C	Nothing to disclose	Mueller, D	Nothing to disclose
Carr, J	Nothing to disclose	Neal, M	Nothing to disclose
Ciraulo, D	Nothing to disclose	Park, M	Nothing to disclose
Cohen, M	Nothing to disclose	Phelan, H	Nothing to disclose
De Castro, G	Nothing to disclose	Potenza, B	Nothing to disclose
De Moya, M	Nothing to disclose	Rozycki, G	Nothing to disclose
Dicker, R	Nothing to disclose		
Diebel, L	Nothing to disclose	Shackford, S	Nothing to disclose
Diebel, M	Nothing to disclose	Smith, S	Nothing to disclose
Edmonds, R	Nothing to disclose	Sperry, J	Nothing to disclose
Feliciano, D	Nothing to disclose	Stein, DM	Nothing to disclose
Ferrigno, L	Nothing to disclose	Schneider, C	Nothing to disclose
Guillamondegui, O	Nothing to disclose	Schreiber, M	Nothing to disclose
Gestring, M	Nothing to disclose	Solomon, D	Nothing to disclose
Haan, J	Nothing to disclose	Vernon, SA	Nothing to disclose
Habib, F	Nothing to disclose	Vercruysee, G	Nothing to disclose
Hauser, C	Novo Nordisk, Consulting fees, PI	Weber, D	Nothing to disclose
Hewitt, L	Nothing to disclose	Wissel, A	Nothing to disclose
Holcomb, J	Nothing to disclose	Zarzaaur, BL	Nothing to disclose
Koehler, D	Nothing to disclose		
Kozar, R	Nothing to disclose		

40^h Annual Meeting
Telluride, Colorado
2009-2010

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2010
2011
2011
2012
2012

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President	Year	Location
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Robert G. Volz, M.	1972	Vail
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William R. Hamsa, M.D.	1974	Aspen
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Glen D. Nelson, M.D.	1978	Steamboat
Gerald D. Nelson, M.D.	1979	Snowmass
Kevin G. Ryan, M.D.	1980	Snowbird
David S. Bradford, M.D.	1981	Jackson Hole
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Earl G. Young, M.D.	1984	Steamboat
Robert B. Rutherford, M.D.	1985	Snowbird
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Robert C. Edmondson, M.D.	1988	Steamboat
Ernest E. Moore, M.D.	1989	Snowbird
Stephen W. Carveth, M.D.	1990	Crested Butte
George E. Pierce, M.D.	1991	Jackson Hole
Peter Mucha, Jr., M.D.	1992	Steamboat
David V. Feliciano, M.D.	1993	Snowbird
R. Chris Wray, M.D.	1994	Crested Butte
David Kappel, M.D.	1995	Big Sky
Thomas H. Cogbill, M.D.	1996	Grand Targhee
G. Jerry Jurkovich, M.D.	1997	Snowbird
James B. Benjamin, M.D.	1998	Lake Louise
Herbert J. Thomas III, M.D.	1999	Crested Butte
Barry C. Esrig, M.D.	2000	Squaw Valley
Steven R. Shackford, M.D.	2001	Big Sky
James A. Edney, M.D.	2002	Whistler-Blackcomb
J. Scott Millikan, M.D.	2003	Snowbird
Harvey J. Sugerman, M.D.	2004	Steamboat
Scott R. Petersen, M.D.	2005	Jackson Hole
Harold F. Sherman, M.D.	2006	Big Sky
Frederick A. Moore, M.D.	2007	Steamboat Springs
James W. Davis, M.D.	2008	Squaw Valley
Grace S. Rozycki, M.D.	2009	Crested Butte
Robert C. Mackersie	2010	Telluride

**The 2011 WESTERN TRAUMA ASSOCIATION Meeting will be held at:
Big Sky, Montana**

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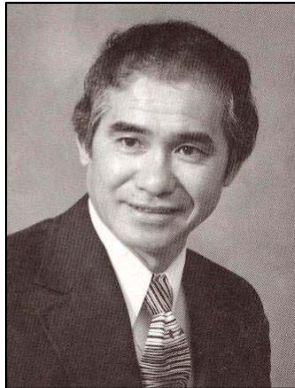
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**Earl G. Young, M.D.
(1928-1989)**



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**

<u>Resident</u>	<u>Institution</u>	<u>Year</u>
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 Of 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

WESTERN TRAUMA ASSOCIATION

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, MD	2007	Steamboat Springs, Colorado
Pamela Kallsen	2008	Squaw Valley, California
Sylvia Campbell, MD	2009	Crested Butte, Colorado
William Schecter, MD	2010	Telluride, Colorado

WESTERN TRAUMA ASSOCIATION
Schedule of Events
February 28 – March 7, 2010

Sunday, February 28

4:30pm – 7:30pm
5:00pm – 7:00pm
5:00pm – 7:00pm
7:00pm – 8:00pm

Registration
Welcome Reception
Children's Reception
Past President's Meeting

Room

Peaks Foyer
Peaks Legends Restaurant
Peaks – Big Billie
Peaks Liberty Bell

Monday, March 1

6:30am – 7:00am
7:00am – 9:00am
7:30am – 9:00am
4:00pm – 6:00pm
6:00pm – 7:00pm

Attendee Breakfast
Scientific Session
Friends & Family Breakfast
Scientific Session
Board Meeting

Conference Center Lobby
Conference Center Ballroom
Peaks Legends Restaurant
Conference Center Ballroom
Peaks Liberty Bell

Tuesday, March 2

6:30am – 7:00am
7:00am – 9:00am
7:30am – 9:00 am
4:00pm – 6:00pm
6:00pm – 7:00pm
7:30pm

Attendee Breakfast
Scientific Session
Friends & Family Breakfast
Scientific Session & Presidential Address
Multi-Center Trial
Officer's Dinner

Conference Center Lobby
Conference Center Ballroom
Peaks Apenglow
Conference Center Ballroom
Conference Center Ballroom
TBD

Wednesday, March 3

6:30am – 7:00am
7:00am – 9:00am
7:30am – 9:00am
10:00am – 12:00pm
12:00pm – 1:30pm
4:00pm – 5:00pm
5:00pm – 6:00pm
5:00pm – 6:00pm

Attendee Breakfast
Scientific Session
Friends & Family Breakfast
NASTAR Race
BBQ
Paint the Ceiling
Business Meeting
Book Club

Conference Center Lobby
Conference Center Ballroom
Peaks Legends Restaurant

Peaks Event Deck
Conference Center Ballroom
Conference Center Ballroom
TBD

Thursday, March 4

6:30am – 7:00am
7:00am – 9:00am
7:30am – 9:00am
4:00pm – 6:00pm
6:30pm – 10:00pm
7:00pm – 10:00pm

Attendee Breakfast
Scientific Session
Friends & Family Breakfast
Scientific Session
Children's Party
Banquet

Conference Center Lobby
Conference Center Ballroom
Peaks Legends Restaurant
Conference Center Ballroom
TBD
Conference Center Ballroom

Friday, March 5

6:30am – 7:00am
7:00am – 9:00am
7:30am – 9:00am
4:00pm – 6:00pm

Attendee Breakfast
Scientific Session
Friends & Family Breakfast
Scientific Session

Conference Center Lobby
Conference Center Ballroom
Peaks Legends Restaurant
Conference Center Ballroom

PROGRAM



Scientific Session 1
Monday AM, March 1, 2010
Moderator: Robert Mackersie, MD
Location: Conference Center Ballroom

Paper	Time	Title/Authors	Page
	7:00AM	Welcome to the 40th Annual Meeting of the WTA Robert C. Mackersie, MD President, WTA 2010	
1	7:20 AM	Honor Thy Father Grace S. Rozycki, MD (Family Abstract)	27
2	7:30 AM	Use of Rectus Abdominous Muscle Flap for Repair of Enterocutaneous Fistulae: A Case Series C. Schneider, J. Fowler, J. Wallace, B. Manning, R. Roettger	29
3	7:40 AM	* Role of ICP in IL-10 Production in an Experimental Model of Resuscitation in Hemorrhagic Shock and TBI D.G. Solomon, L.J. Kaplan, K.A. Davis, N.V. Malkevich, A. Scultetus, F. Arnaud, Y. Chen, D. Freilich, S. Ahlers, R.M. McCarron	31
4	8:00 AM	* Blood Volume Analysis Can Distinguish True Anemia from Hemodilution in Critically ill Trauma Patients P.Y. Van, S.D. Cho, S.J. Underwood, G.J. Hamilton, L.B., Ham, M.A. Schreiber	33
5	8:20 AM	* A Decade's Experience with Balloon Catheter Tamponade for the Emergency Control of Hemorrhaging Injuries C.G. Ball, A.D Wyrzykowski, J.M. Nicholas, D.V. Feliciano	35
6	8:40 AM	*Helicopters Improve Survival in Patients with Significant Injury Requiring Interfacility Transfer for Definitive Care J.B. Brown, N.A. Stassen, P.E. Bankey, A.T. Sangosanya, J.D. Cheng, M.L. Gestring	37

* Earl Young Competition

Scientific Session 2
Monday PM, March 1, 2010
Moderator: Chris Cocanour, MD
Location: Conference Center Ballroom

Paper	Time	Title/Authors	Page
7	4:00 PM	Sew It Up! A Western Trauma Association Multi-Institutional Study of Injury Management in the Post-Injury Open Abdomen C.C. Burlew, E.E. Moore, J. Cuschieri, G.J. Jurkovich, P. Codner, K.L. Kaups, K. Crowell, R. Nirula & the WTA Multicenter Trials Group	39
8	4:20 PM	*New Hemostatic Dressing (FAST Dressing) Reduces Blood Loss and Improves Survival in a Grade V Liver Injury Model G. De Castro, M. MacPhee, I. Driscoll, D. Beall, J. Hsu, S. Zhu, J. Hess, T. Scalea, G. Bochicchio	41
9	4:40 PM	* Rib Fixation; No Difference in Pain A. Bramos, Y. Chang, M. Fikry, S. Janjua, D. King, H. Alam, G. Velmahos, M. de Moya	43
	5:00 PM	Critical Decisions in Trauma Moderator: Robert McIntyre Operative Treatment of Liver Injury Rosemary Kozar, M.D. Evaluation and Management of Peripheral Vascular Injury – Part 1 David V. Feliciano, M.D.	45
	6:00 PM	Board of Directors Meeting	

* Earl Young Competition

Scientific Session 3
 Tuesday AM, March 2, 2010
 Moderator: Herb Thomas, MD
 Location: Conference Center Ballroom

Paper	Time	Title/Authors	Page
10	7:00 AM	* Hypotensive Resuscitation Reduces Intra-Operative Transfusion Requirements and Severe Post-Operative Coagulopathy: Preliminary Results of a Randomized Controlled Trial C. Morrison, M. Carrick, M. Norman	51
11	7:20 AM	* Inappropriate Pre-Injury Warfarin in Trauma: Time for a National Safety Initiative D. Baillie, B. Hoey, E. Nogueira, C. Stehley, M. Granson	53
12	7:40 AM	* Body Adipose Content is Independently Associated with a Higher Risk of Organ Failure and Nosocomial Infection in the Non-Obese Patient Post Injury R. Edmonds, T. Billiar, A. Peitzman, A. Rosengart, J. Minei, J. Cuschieri, R. Maier, B. Harbrecht, J. Sperry	55
13	8:00 AM	Are the New 60's Really the Old 40's? Three Friends for Three Decades Attempt to Answer the Question T. Cogbill, J. Cogbill, E. Moore, S. Moore, S. Shackford, E. Shakford	57
14	8:10 AM	* Is Early Venous Thromboembolism Prophylaxis Safe in Trauma Patients with Intracranial Hemorrhage? D. Koehler, S. Fleming, J. Shipman, M. Davidson, O. Guillaumondegui	59
	8:30 AM	Point : Counterpoint 1 The PA Catheter! Too Soon Abandoned? Michael West & Kimberly Davis	61

* Earl Young Competition

Scientific Session 4
 Tuesday PM, March 2, 2010
 Moderator: Dean Gubler, MD
 Location: Conference Center Ballroom

Paper	Time	Title/Authors	Page
15	4:00 PM	*A Leg To Stand On: The Racial Odds for Amputation Ratio (ROAR) in Traumatic Lower Extremity Fractures D. Weber, D. Shoham, R.L. Reed, F. Luchette	63
16	4:20 PM	* Impact of Gender on Ventilator – Associated Pneumonia Outcome Following Trauma S. Berry, L. Magnotti, B. Zarzaur, P. Fischer, J. Swanson, P. Clement, T. Schroepfel, T. Fabian, M. Croce	65
17	4:40 PM	* Over-Reliance on CT Imaging in Patients with Severe Abdominal Injury: Is the Delay Worth the Risk? M. Neal, A. Peitzman, T. Billiar, G. Marshall, G. Watson, J. Sperry	67
	5:00 PM	Presidential Address Robert C. Mackersie, M.D.	69

* Earl Young Competition

Scientific Session 5
 Wednesday AM, March 3, 2010
 Moderator: Marty Schreiber, MD
 Location: Conference Center Ballroom

Paper	Time	Title/Authors	Page
18	7:00 AM	* The Unique Pattern of Complications in Elderly Trauma Patients at a Level 1 Trauma Center S. Adams, B. Cotton, E. Dipasupil, J. Podbielski, A. Zaharia, J. Smith, D. Ware, B. Gill, R. Albarado, R. Kozar, E. Gonzalez, J. Duke, P. Adams, C. Dyer, J. Holcomb	71
19	7:20 AM	Defining the Limits of Resuscitative Emergency Department Thoracotomy; A Contemporary Western Trauma Association Perspective E.E. Moore, M.M. Knudson, C.C. Burlew, K. Inaba, R.A. Dicker, W.L. Biffi, A.K. Malhotra, K.L. Kaups, T.D. Browder, R. Coimbra, J.M. Haun, E.A. Gonzalez, D.H. Livingston and the WTA Study Group	73
20	7:40 AM	* The Use of Contrast Enhanced Ultrasound for Evaluation of Solid Organ Injury in Patients with Blunt Abdominal Trauma J. Mihalik, A. Putnam, J. Foster, S. Smith	75
21	8:00 AM	Open Fractures: Impact of Delay in Operative Debridement and Irrigation A. Malhotra, N. Martin, N. Willis, R. Mounasamy, T. Duane, M. Aboutanos, K. Guilford, J. Whelan, J. Mayglothling, R. Ivatury	77
22	8:20 AM	Adaptation: The Key to Family Survival During Military Deployment Gary A. Vercruysse (Family Abstract)	79
	8:30 AM	Point: Counterpoint 2 Damage Control (1:1:1) Hemostatic Resuscitation: A Proved Concept? John B. Holcomb and E.E. Moore	81

* Earl Young Competition

Scientific Session 6
Wednesday PM, March 3, 2010
Moderator: Michael West, MD
Location: Conference Center Ballroom

Paper	Time	Title/Authors	Page
23	4:00 PM	Cardiopulmonary Resuscitation in the Field: A Battle Worth Fighting For? R.C. Mooty, K. Olivera, A. Mangram, E. Dunn	83
	4:10 PM	Paint the Ceiling Lecture “Meditation on Mortality: Lessons from a Life in Surgery” William Schecter, M.D.	85
	5:00 PM	Business Meeting	

Scientific Session 7
 Thursday AM, March 4, 2010
 Moderator: Ajai Malhotra, MD
 Location: Conference Center Ballroom

Paper	Time	Title/Authors	Page
24	7:00 AM	* An Assessment of Patient Satisfaction with Non-Operative Management of Clavicular Fractures Using the DASH Outcome Measure T. Thormodsgard, D. Ciraulo, K. Stone	87
25	7:20 AM	Pediatric Radiation Exposure During the Initial Evaluation for Blunt Trauma D.L. Mueller, M.R. Hatab, C. Brougher, R. Al-Senan, M.G. Corneille, D.L. Dent, J.G. Myers, R.M. Stewart, S.E. Wolf, S.M. Cohn	89
26	7:40 AM	*Gender Dimorphism in the Gut Following Shock: Mucosal Protection by Estrogen Stimulation of IGA Transcytosis M. Diebel, D. Liberati, L. Diebel	91
27	8:00 AM	Unusually Large Traumatic Right Diaphragmatic Hernia in Association with a Congenital Cleft on the Liver Presenting 10 Years After a Motor Vehicle Crash: A Case Report A. Wissel	93
28	8:10 AM	Superior Mesenteric Vein Avulsion From Blunt Assault: A Rare and Potentially Lethal Injury B. Joseph, B. Madigan, L. Lucas, N. Kulvatunyou, R. Friese, T. O'Keefe, J. Wynne, J. Hughes, J. Mills, R. Latifi, P. Rhee	95
	8:20 AM	Invited Basic Science Lecture "War and Peace at the Mucosal Surface: A Toll-Story" Lawrence Diebel, MD	97

* Earl Young Competition

Scientific Session 8
 Thursday PM, March 4, 2010
 Moderator: Tom Scalea, MD
 Location: Conference Center Ballroom

Paper	Time	Title/Authors	Page
29	4:00 PM	Development and Testing of Low Volume, Hypertonic, Hyperoncotic, Spray-Dried Plasma for the Reversal of Trauma-Associated Coagulopathy F. Shuja, E. Fukudome, R. Finkelstein, M. Duggan, T. Kheirbek, T. Fischer, G. Belmahos, M. de Moya, D. King, H.B. Alam	99
30	4:20 PM	A Prospective Trial of Domestic Violence Screening in Female Inpatients L. Hewitt, P. Bhavasar, H. Phelan	101
31	4:40 PM	Standard Enoxaparin Dosing May not Provide Adequate Drug Levels for Either Prophylactic or Therapeutic Thromboprophylaxis in Seriously Injured Burn Patients B. Potenza, D. Bhavasar, D. Lerner, G. Lew, J. Lee, J. Noordenbos, M. Tenenhaus, V. Bansal, J. Doucet, R. Coimbra	103
	5:10 PM	Panel of Experts Moderator: Tom Scalea Panel: Carl Hauser, Carlos Brown, Paul Harrison, Karen Brazel	105

Scientific Session 9
 Friday AM, March 5, 2010
 Moderator: Nick Namias, MD
 Location: Conference Center Ballroom

Paper	Time	Title/Authors	Page
32	7:00 AM	Risk Factors for Failed Extubation in Trauma Patients C. Brown, K. Foulkrod, B. Brouillette, C. Czysz, M. Martinez, H. Cooper	109
33	7:20 AM	Trauma Patients Can Be Managed Without a Swan-Ganz Catheter With Improved Outcome, But It May Be Beneficial in Select Patients G. Barmparas, C. Georgiou, K. Inaba, P. Hatjizacharia, L. Chan, D. Demetriades, H. Belzburg, R. Frieze, P. Rhee	111
34	7:40 AM	Long-Term Functional and Echocardiographic Assessment After Penetrating Cardiac Injury: Five Year Follow-Up Results J.A. Carr, R. Buterakos, W.M. Bowling, L. Janson, K.A. Kralovich, C. Copeland, R. Link, C. Roiter, G. Casey, J.W. Wagner	113
35	8:00 AM	Quality of Life After Delayed Abdominal Wall Reconstruction Following Open Abdomen B.L. Zarzaur, C.P. Shahan, L.J. Magnotti, K. Emett, J.M. DiCocco, M.A. Croce, T.C. Fabian	115
36	8:20 AM	Efficiency of Information Transfer During Trauma Handover: A Pilot Study F. Habib, C. Schulman, L. Klein, J. Graygo, C. Mena, E. Perdeck, J. Augenstein	117
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Scientific Session 10
 Friday PM, March 5, 2010
 Moderator: R. Stephen Smith, MD
 Location: Conference Center Ballroom

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ABSTRACTS



**HONOR THY FATHER
(Family Abstract)**

G. Rozycki
Emory University School of Medicine

Presenter: Grace S. Rozycki, MD

Senior Sponsor: Grace S. Rozycki, MD

Although I never had the opportunity to meet my father-in-law, I have learned so much about him over the years through an annual Named Lectureship that is held in his honor at the hospital where he practiced. My father-in-law was a general surgeon who practiced for 49 years in a small community in the Northeast. He was a beloved figure and role model who not only served his patients, but served the entire community as he was the physician for the local Board of Health, Board of Education, and the sports teams at the local high school. The Lectureship was initiated by his oldest son (my husband) who is also a surgeon. It is now in its 18th year and is given at the hospital where my father-in-law practiced surgery, was Chief of Surgery and Chief of Staff. The lectures have been given by surgeons who are renowned in their fields, and five of the presenters are members of the Western Trauma Association. In addition to honoring a beloved physician and providing CME credit for local and guest physicians, this annual event has several other advantages. It serves as a reunion for my father-in-law's extended family, former colleagues, office employees, and patients. Through this wonderful event, I have met the extended family and friends, become closer to my in-laws, and developed an enormous respect for this beloved physician, who served his community selflessly in ways that seem to have been forgotten in recent years. Finally, I understand my husband better through the role model who is largely responsible for shaping him. What a great way to have a family get-together, learn something new in surgery, and Honor thy Father.

USE OF A RECTUS ABDOMINIS MUSCLE FLAP FOR REPAIR OF ENTEROCUTANEOUS FISTULAE: A CASE SERIES

C Schneider, J Fowler, J Wallace, B Manning, R Roettger
Greenville Hospital System University Medical Center

Presenter: Chris Schneider, MD **Senior Sponsor:** Richard Roettger, MD, FACS

Introduction: Enterocutaneous fistulae are uncommon but serious complications following abdominal surgery. The mortality from these complex fistulae is reported in the literature to be as high as 80%. When control and closure of the fistula drainage becomes impossible, wound complications and malnutrition result. For patients with fistulae that fail to close spontaneously and open abdominal wounds or other sequelae make standard fistula resection and closure difficult, creative treatment options are necessary. Our technique of fistula closure using the rectus abdominis muscle flap is described and reviewed.

Methods: We identified patients with open abdominal wounds and enterocutaneous fistulae that failed to close despite appropriate medical treatment. Primary closure of the fistula with wound coverage using a rectus abdominis flap was performed in these patients. Patients were followed clinically and surgical sites were routinely evaluated.

Results: Four (4) patients were identified with persistent enterocutaneous fistulae and open abdominal wounds. Two resulted from trauma, one from necrotizing fasciitis, and one from irradiation. All four patients had a single fistula identified. Each fistula was covered with either a contralateral or ipsilateral rectus flap. All fistulas resolved with this treatment without further surgical intervention.

Discussion: The high morbidity and mortality in patients with enterocutaneous fistulae makes effective treatment options important. The presence of an open abdomen can make treatment more challenging. This is the first case series showing a reproducible outcome using this technique of fistula closure.

ROLE OF ICP IN IL-10 PRODUCTION IN AN EXPERIMENTAL MODEL OF RESUSCITATION IN HEMORRHAGIC SHOCK AND TBI

D.G. Solomon, M.D., L.J. Kaplan, M.D., K.A. Davis, M.D., N.V. Malkevich, Ph.D., A. Scultetus, M.D., F. Arnaud, M.D., Y. Chen, Ph.D., D. Freilich, M.D., S. Ahlers, Ph.D., R.M. McCarron, Ph.D. Yale University School of Medicine Naval Medical Research Center

Presenter: Daniel Solomon, M.D.

Senior Sponsor: Kimberly Davis, M.D.

Background: Advances in force protection and evacuation of combat wounded have allowed increasing numbers of soldiers with polytrauma and TBI to survive to hospital arrival. Those who survive their initial injury, however, often succumb to the late sequelae of multisystem organ failure (MSOF). Ongoing research into MSOF has implicated multiple cytokines including IL-6 and IL-10 as early pathogenic markers of MOF.

This current study aims to identify if the pre-hospital resuscitation hemoglobin based oxygen carrier-201 (HBOC-201) alters immune profiles following hemorrhagic shock combined with traumatic brain injury. Moreover, we investigate the association of immunologic flux with derangements in physiologic parameters following injury

Methods: Anesthetized Yorkshire swine underwent fluid percussion TBI and uncontrolled liver hemorrhage. Animals were randomized to receive either HBOC-201 (n=22), Lactated Ringer's (LR; n=20) or no resuscitation (NON; n=16) during the simulated prehospital phase. Following simulated hospital arrival the liver injury was repaired and animals were provided either whole blood transfusion or normal saline as needed. Serial blood samples analyzed for IL-6 and IL-10 by enzyme linked immunosorbant assay (ELISA). Animals were euthanized at 6 hours and IL-4, IL-6 and IL-10 expression was measured in liver and lung tissue by real time polymerase chain reaction (rtPCR)

Results: Survival was greatest among animals who received HBOC (59%) compared to LR (25%) and NON (29%) (p=0.05). Minimal differences in cytokine profiles were demonstrated among resuscitation groups, or between survivors and non-survivors. Among survivors, when animals experienced a sustained increase in intracranial pressure (ICP) hepatic and pulmonary expression of IL-10 were significantly increased (Hepatic IL-10: 9.7 fold vs 1.21 fold increase over sham, p=0.004. Pulmonary IL-10: 3.55 fold vs. 1.39 fold increase over sham, p=0.02) and serum IL-10 concentration at 75min was significantly increased (2.17 fold vs 1.17 fold over baseline, p=0.05)

Conclusions: IL-10 expression is associated with increasing ICP, indicating a possible role in the early diagnosis and perhaps prophylaxis of post injury MSOF. Furthermore, despite a survival benefit, pre-hospital resuscitation with HBOC-201 does not influence the measured immune parameters.

BLOOD VOLUME ANALYSIS CAN DISTINGUISH TRUE ANEMIA FROM HEMODILUTION IN CRITICALLY ILL TRAUMA PATIENTS

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Oregon Health & Science University Department of Surgery Division of Trauma and Critical Care

Presenter: Philbert Y. Van, M.D. **Senior Sponsor:** Martin A. Schreiber, M.D.

Introduction: Decreased peripheral hematocrit (pHct) is traditionally used as a marker for blood loss. In critically ill trauma patients who are fluid resuscitated, pHct may not adequately represent red blood cell volume (RBCV). We hypothesize that the use of pHct alone may overestimate anemia, potentially leading to unnecessary interventions.

Methods: Patients admitted to the trauma intensive care unit underwent blood volume analysis. Serial blood samples were collected after injection of ^{131}I -albumin. Samples were then processed by the BVA-100 Blood Volume Analyzer (Daxor Corporation, New York, NY). RBCV and total blood volume (TBV) were calculated using the directly measured plasma volume (PV) and pHct. A computed normalized hematocrit (nHct) adjusts pHct to the patient's ideal blood volume.

Results: Twenty-seven patients (13 male) with a mean age of 49.6 ± 3.8 years, APACHE II score 17.9 ± 1.5 , and ISS 29.8 ± 2.5 had 65 blood volume analyses performed on three consecutive days. Using ratios of TBV compared to ideal TBV, patients were stratified into three separate groups: hypovolemic (12/65), normovolemic (20/65), and hypervolemic (33/65). Mean differences between pHct and nHct in each group were 5.2 ± 3.3 ($p < 0.001$), 0.1 ± 1.2 ($p = 0.83$), and -6.4 ± 4.4 ($p < 0.001$) respectively. pHct when compared to nHct, diagnosed anemia (Hct < 30) equally within the hypovolemic and normovolemic groups. However, pHct overdiagnosed anemia in 54.5% of hypervolemic patients.

Conclusion: Use of blood volume analysis in critically ill trauma patients may help to distinguish true anemia from hemodilution, potentially preventing unnecessary interventions.

A DECADE'S EXPERIENCE WITH BALLOON CATHETER TAMPONADE FOR THE EMERGENCY CONTROL OF HEMORRHAGING INJURIES

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Department of Surgery, Emory University School of Medicine.

Presenter: Chad G. Ball

Senior Sponsor: David V. Feliciano

Background: Balloon catheter tamponade is a valuable technique for arresting exsanguinating hemorrhage. Indications include: (1) inaccessible major vascular injuries, (2) large cardiac injuries, and (3) deep solid organ parenchymal bleeding. Published literature is limited to small case series. The primary goal was to review a large practice pattern of balloon catheter use for emergency tamponade in a trauma population.

Methods: All patients requiring balloon catheters to tamponade exsanguinating hemorrhage (1998-2009) were included. Demographics, injuries, techniques, and outcomes were analyzed.

Results: Of the 44 severely injured patients (82% presented with hemodynamic instability; mean base deficit = -20.4) who required balloon catheter tamponade, 23 (52%) remained indwelling for >24 hours. Mortality depended on the site of injury and indwelling time (81% if <24 hours; 52% if >24 hours)($p < 0.05$). Physiologic exhaustion caused 76% of deaths in patients with short-term catheters. Mortality among patients with balloon catheters indwelling for >24 hours was 11% (liver), 50% (abdominal vascular) and 88% (facial/pharyngeal). Mean indwelling times for iliac, liver and carotid injuries were 31, 53 and 78 hours respectively. Overall survival rates were 67% (liver), 67% (extremity vascular), 50% (abdominal vascular), 38% (cardiac) and 8% (face). Techniques included Foley, Fogarty, Blakemore, and Penrose with red rubber Robinson catheters. Initial tamponade of bleeding structures was successful in 93% of cases.

Conclusions: Balloon catheter tamponade can be employed in multiple anatomic regions for variable patterns of injury to arrest ongoing hemorrhage. Placement for central hepatic gunshot wounds is particularly useful. This technique remains a valuable tool in a surgeon's armamentarium.

HELICOPTERS IMPROVE SURVIVAL IN PATIENTS WITH SIGNIFICANT INJURY REQUIRING INTERFACILITY TRANSFER FOR DEFINITIVE CARE

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Strong Regional Trauma Center, University of Rochester School of Medicine, Rochester, New York

Presenter: Joshua B. Brown, BA **Senior Sponsor:** Kim A. Davis, MD

Objective: Helicopter transport (HT) is frequently utilized in the transfer of injured patients from a referring hospital (RH) to a trauma center. The benefits of HT over conventional ground transport (GT) in this setting are unclear. The objective of this study was to determine if HT is associated with a survival benefit when utilized for inter-facility (IF) transport of trauma patients.

Methods: Patients undergoing IF transfer from a RH to a trauma center by HT or by GT in 2007 were identified using the NTDB v8. Demographics, injury severity, and outcomes were compared. Stepwise logistic regression was used to determine if transport modality was a predictor of survival after controlling for the following covariates: age >55, gender, mechanism, ISS, SBP<90, GCS≤8, RR<10 or >29, mechanical ventilation, emergent operation, and ICU admission. This analysis was repeated in subgroups of subjects with ISS >15 and ISS ≤ 15.

Results: Transport data was available for 427,493 patients (84%), of which 74,779 were transferred from a RH either by helicopter (20%) or by ground (80%). Injury characteristics and outcome measures for both HT and GT patients were compared (Table). Regression analysis for IF transfers overall showed transport modality was not a predictor of survival (p=0.07). HT was an independent predictor of survival in subjects with ISS>15 (OR 1.09; 95%CI 1.02-1.17, p=0.01), but not in subjects with ISS≤ 15 (OR 1.06; 0.92-1.24, p=0.4).

	Helicopter (n=14,771)	Ground (n=60,008)	OR (95%CI)
Age (years±SD)*	38±22	41±25	-
Mechanism (%blunt)	90	94	1.57 (1.47-1.68)
Overall survival (%)	92	96	0.40 (0.37-0.43)
Time to RH (mean±SD)*	28±27	14±16	-
Time at RH (mean±SD)*	26±17	19±13	-
Transport time (mean±SD)*	61±55	98±71	-
Total time (mean±SD)*	118±59	133±70	-
ISS (mean±SD)*	17±11	12±9	-
ISS >15 (%)	49	28	2.53 (2.43-2.63)
GCS ≤ 8 (%)	25	7	4.36 (4.10-4.63)
SBP < 90 (%)	4	2	2.11 (1.90-2.35)
RR < 10 or > 29 (%)	11	4	2.91 (2.73-3.12)
LOS (days±SD)*	9±11	6±9	-
ICU Admission (%)	54	29	2.86 (2.75-2.96)
ICU LOS (days±SD)*	7±10	5±9	-
Ventilated (%)	25	9	3.49 (3.33-3.66)
Vent days (days±SD)	7±10	7±10	-
Emergent OR (%)	19	13	1.52 (1.43-1.60)
Discharged <24hr (%)	8	16	0.44 (0.42-0.47)

* P<0.05 for Helicopter vs. Ground

Conclusions: Trauma patients transferred by helicopter for definitive care had shorter overall transport times but were more severely injured and required more trauma center resources than those transported by ground. For patients with ISS >15, HT was associated with a survival advantage when compared to GT. These findings should be considered when developing IF trauma transfer policies for patients with significant injuries.

SEW IT UP! A WESTERN TRAUMA ASSOCIATION MULTI-INSTITUTIONAL STUDY OF INJURY MANAGEMENT IN THE POST-INJURY OPEN ABDOMEN

CC Burlew, EE Moore, J Cuschieri, GJ Jurkovich, P Codner, KL Kaups, K Crowell, R Nirula, and the WTA Multicenter Trials Group
Denver Health Medical Center

Presenter: Clay Cothren Burlew, MD

Senior Sponsor: Clay Cothren Burlew, MD

Background: Use of damage control surgery techniques has reduced mortality in critically injured patients but at the cost of the open abdomen. With the option of delayed definitive management of enteric injuries, the question of primary repair/anastomosis versus stoma creation has been posed with no clear consensus. The *purpose* of this study was to determine outcomes based upon management of enteric injuries in patients relegated to the post-injury open abdomen.

Methods: Patients requiring an open abdomen following trauma from 1/1/02 to 12/31/07 were reviewed. Type of bowel repair was categorized as immediate repair (IR), immediate anastomosis (IA), delayed anastomosis (DA), stoma (S) and a combination (C). Logistic regression was used to determine independent effect of risk factors on leak development.

Results: During the six year study period, 204 patients suffered enteric injuries and required an open abdomen. The majority were men (77%) sustaining blunt trauma (66%) with a mean age of 37.1 ± 1.2 and median ISS of 27 (interquartile range = 20-41). Injury patterns included 81 (40%) SB, 37 (18%) colonic, and 86 (42%) combined injuries. Enteric injuries were managed with IR (58), IA (15), DA (96), S (10), and C (22); 3 patients died prior to definitive repair. 61 patients suffered intraabdominal complications: 35 (17%) abscesses, 15 (7%) leaks, 11 (5%) EC fistulas. The majority of patients with leaks had an anastomosis; 1 patient had a right colon repair. Leak rate subdivided by location of anastomosis is noted.

	Leak Rate		
	IA	DA	Overall
SB Anastomosis (n=62)	0/12	2/50 (4%)	2/62 (3%)
Right Colon Anastomosis (n=38)	0/4	1/34 (3%)	1/38 (3%)
Transverse Colon Anastomosis (n=5)	0/0	1/5 (20%)	1/5 (20%)
Left Colon Anastomosis (n=22)	0/1	10/21 (48%)	10/22 (45%)

There were no differences in ED physiology, injury severity, transfusions, crystalloids, or demographic characteristics between patients with and without leak. Leak cases had higher 12 hr HR (148 vs. 125, $p=0.02$) and higher 12 hr BD (13.7 vs. 9.7, $p=0.04$), suggesting persistent shock and consequent hypoperfusion were related to leak development. There was a significant trend toward higher incidence of leak with closure day (Chi-square for trend, $p=0.01$), with closure > day 5 having a 4 times higher likelihood of developing leak (3% vs 12%, $p=0.02$).

Conclusions: Repair or anastomosis of identified injuries should be considered in all patients. Leak rate, however, increases with fascial closure beyond day 5 and left-sided colonic anastomoses. Investigating the vulnerability of the left colon at a mechanistic level is warranted.

NEW HEMOSTATIC DRESSING (FAST DRESSING) REDUCES BLOOD LOSS AND IMPROVES SURVIVAL IN A GRADE V LIVER INJURY MODEL

G.De Castro, M.D., M MacPhee PhD, I.Driscoll, M.D. D. Beall MS, J. Hsu, M.P.H., S. Zhu, Ph.D, J Hess MD, T Scalea MD and G.Bochicchio M.D, MPH
University of Maryland

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

Background: Despite recent advances in surgical techniques, biological products and health-care strategies, nearly 80% of trauma operating room deaths continue to be associated with uncontrolled hemorrhage. We evaluated the efficacy of a new biologic hemostatic dressing (Fast Dressing), in treating a grade V liver injury in non-coagulopathic swine.

Methods: Sixteen female splenectomized non-coagulopathic swine underwent reproducible grade V liver injuries. The animals were then randomized into two treatment groups: 1) Fast Dressing (n=8) or 2) Ig G placebo dressing (n=8). After 30 seconds of uncontrolled hemorrhage, dressings in combination with manual compression were applied for 4 minutes. If bleeding persisted, reapplication was permitted. The number of dressings used, time to hemostasis, total blood loss, mean arterial pressure, blood chemistry, and total resuscitation fluid volume were monitored for 2 hours after injury.

Results: There were no significant differences in the 2 groups between baseline weight and blood pressure. The Fast Dressing significantly reduced blood loss (412.5 ± 201 cc), compared to 2064 ± 913 cc) in the placebo group ($p = 0.001$). All animals in the Fast Dressing group achieved hemostasis and survived for 2 hours post-injury while none of the animals in the placebo group attained hemostasis or survived to 2 hours post-injury ($p < 0.001$). The mean time to hemostasis was 6.6 ± 2.5 minutes in the Fast Dressing group.

Conclusions: The Fast Dressing is able to achieve consistent rapid hemostasis, reduced blood loss, and improved survival in a grade V liver injury swine model. Its efficacy and ease of use has implications for application in both civilian and military settings.

RIB FIXATION: NO DIFFERENCE IN PAIN

A. Bramos, Y. Chang, M. Fikry, S. Janjua, D. King, H. Alam, G. Velmahos, M. de Moya
 Massachusetts General Hospital

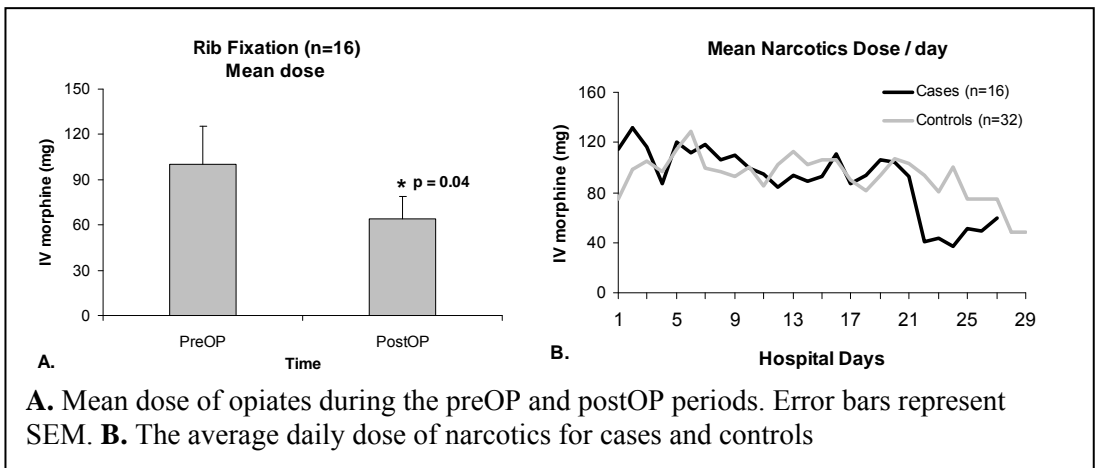
Presenter: A. Bramos

Senior Sponsor: M. de Moya

Introduction: The use of rib fixation for multiple rib fractures remains controversial. We hypothesized that patients who have their ribs plated would experience less pain compared to controls and thus require fewer opiates. Further, we hypothesized that improved pain control would result in fewer pulmonary complications and decreased length of stay (LOS).

Methods: This is a retrospective bi-institutional matched case-control study. Cases were matched by age, ISS, chest AIS, head AIS, pulmonary contusion score and number of fractured ribs in a 1:2 ratio. The daily total doses of analgesic drugs were converted to equianalgesic IV morphine doses.

Results: Sixteen patients underwent rib fixation in 5±3 days after injury using 3 metallic plates on average (08/2002 to 06/2009). Morphine requirements decreased from 100 ± 100 mg preoperatively to 64 ± 60 mg postoperatively (p = 0.04). There were no significant differences between cases and controls in the mean morphine dose (76 ± 66 vs. 67 ± 57 mg, p = 0.67), hospital stay (18 ± 11.5 vs. 15 ± 11 days, p = 0.26), ICU stay (9 ± 8 vs. 7 ± 10 days, p = 0.36), ventilation days (9 ± 8 vs. 9 ± 11, p = 0.59), and pneumonia rates (19% vs. 34%, p = 0.84).



Conclusion: The need for analgesia was significantly reduced after rib fixation in patients with multiple rib fractures. However, no difference in outcomes was observed when these patients were compared with matched controls who did not receive rib fixation.

Critical Decisions in Trauma

Moderator: Robert McIntyre

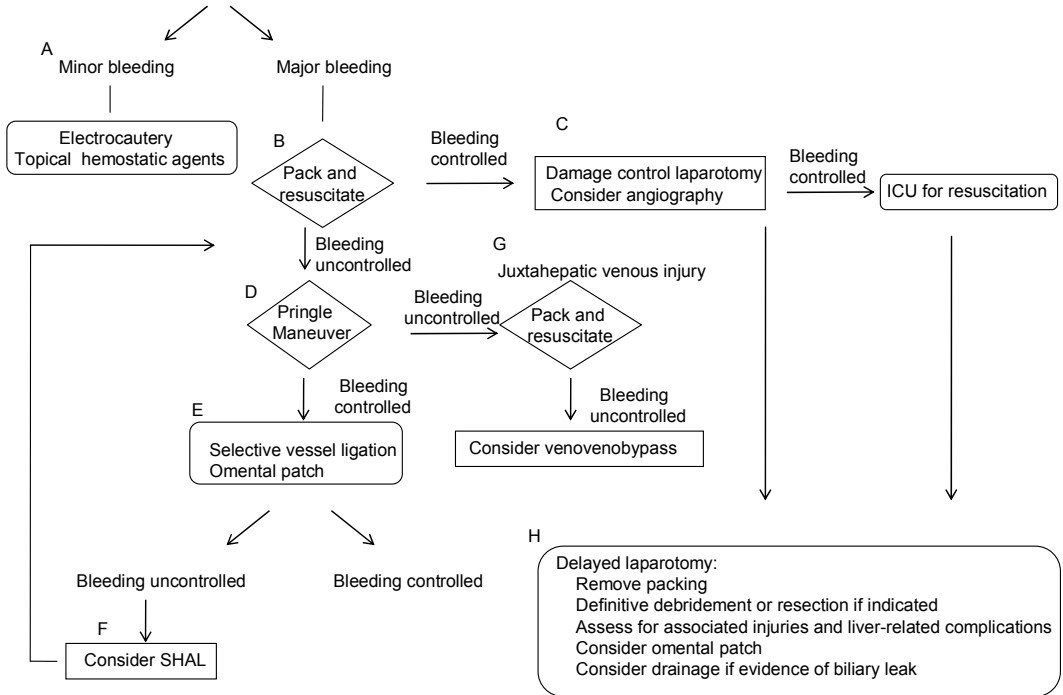
Operative Treatment of Liver Injury

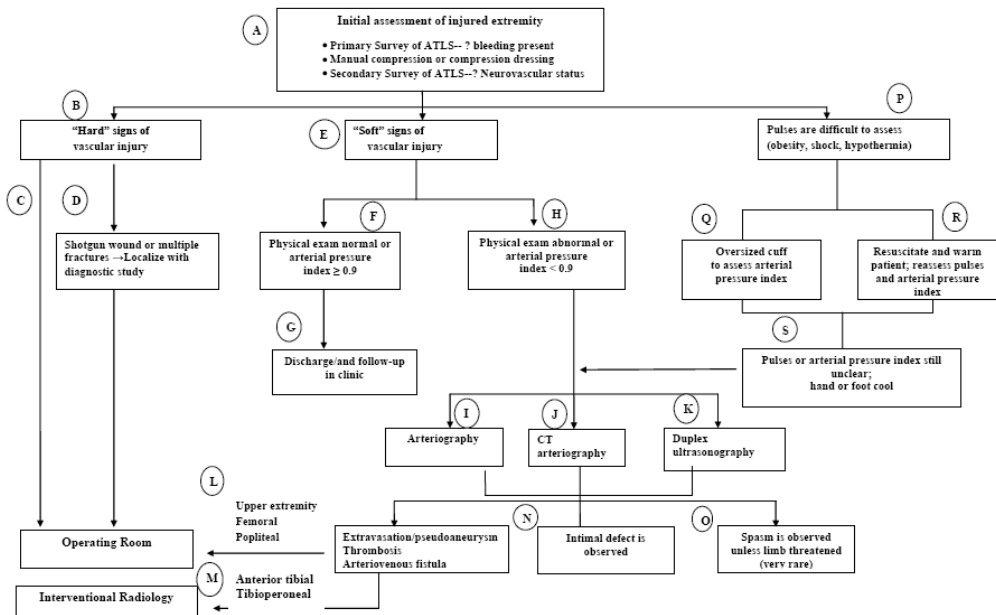
Rosemary Kozar, MD

Evaluation and Management of Peripheral Vascular Injury – Part 1

David V. Feliciano, MD

Operative management of blunt hepatic trauma





HYPOTENSIVE RESUSCITATION REDUCES INTRA-OPERATIVE TRANSFUSION REQUIREMENTS AND SEVERE POST-OPERATIVE COAGULOPATHY: PRELIMINARY RESULTS OF A RANDOMIZED CONTROLLED TRIAL

C. Morrison, M. Carrick, M. Norman
Baylor College of Medicine

Presenter: C. Anne Morrison

Senior Sponsor: Susan I. Brundage

Background: Previous studies suggest that limiting fluids given by following a strategy of permissive hypotension during initial resuscitation may improve trauma outcomes. This study examines the clinical outcomes from the first 90 subjects enrolled in a prospective randomized controlled trial, to determine if hypotensive resuscitation decreases the risk of coagulopathy.

Methods: Patients in hemorrhagic shock who required emergent surgery were randomized to one of two arms. Those in the experimental Low Mean Arterial Pressure (LMAP) arm were managed with a target minimum mean arterial pressure of 50mmHg. Those in the control High Mean arterial pressure (HMAP) arm were managed a target mean arterial pressure of 65mmHg. Patients were followed for 30 days. Intra-operative fluid requirements, mortality, post-operative complications, and other clinical data were prospectively gathered and analyzed.

Results: Subjects in the LMAP group received a significantly less blood products and total IV fluids during intra-operative resuscitation than those in the HMAP group. Despite receiving significantly less blood products intraoperatively, those in the LMAP group overall had similar post-operative INR and hematocrit. Among those who developed coagulopathy (INR>1.5), subjects in the LMAP group had significantly lower INR than those in the HMAP group, indicating a less severe coagulopathy (2.4 versus 6.3, p=0.02). Significantly fewer subjects in the LMAP group died of bleeding associated with coagulopathy (0 versus 7, p<0.01).

Conclusions: Hypotensive resuscitation by employing a strategy of maintaining a target minimum mean arterial pressure of 50mmHg, rather than 65mmHg, significantly decreases intra-operative transfusions and post-operative coagulopathy in trauma patients with hemorrhagic shock.

	MAP=50				MAP=65				p-value
	n	mean	SD	CI	n	mean	SD	CI	
OR Fluids									
PRBC's (mL)	44	1335	1812	(784, 1886)	40	2400	2524	(1593, 3207)	0.03
FFP (mL)	44	198	471	(54, 341)	40	532	813	(272, 792)	0.02
Blood Products (mL)	44	1594	2292	(897, 2291)	40	3017	3320	(2009, 4133)	0.02
Total fluids	44	5070	3631	(3952, 6187)	40	7040	4676	(5544, 8535)	0.03
Est. Blood Loss (mL)	44	1964	2215	(1290, 2637)	46	3252	3056	(2275, 4230)	0.03
Post-op LabValues									
INR	38	1.5	0.7	(1.3, 1.7)	34	2.1	2.5	(1.2, 3.0)	0.18
Hematocrit	38	30.2	8.0	(26.5, 34.0)	29	29.4	2.3	(24.5, 31.2)	0.77

INAPPROPRIATE PRE-INJURY WARFARIN IN TRAUMA: TIME FOR A NATIONAL SAFETY INITIATIVE

D. Baillie, B. Hoey, E. Nogueira, C. Stehly, M. Granson
St. Luke's Hospital

Presenter: Dan Baillie

Senior Sponsor: Brian Hoey

Introduction: Pre-injury warfarin has been shown to worsen outcomes in trauma patients. We hypothesize that a significant number of trauma patients are on pre-injury Warfarin for inappropriate indications.

Methods: A 5 year retrospective review of registry data from a Level I trauma center was conducted from 2004-2008. Data collected included age, Injury Severity Score (ISS), Abbreviated Injury Score (AIS) for head, mortality, indication(s) for anticoagulant therapy, admission Glasgow Coma Score, and admission INR. Statistical differences were determined using the chi-square test and the Mann-Whitney rank sums test.

Results: 10,529 patients were evaluated by the trauma service over this time period: 646 (6%) were on Warfarin. Mean age in the Warfarin group was 77.3; mean ISS was 10.3. 645 (99.8%) were blunt trauma victims. As per the American College of Chest Physician Guidelines, 25% (159) of the patients were on Warfarin for inappropriate reasons. The most common appropriate indications were atrial fibrillation (49%) and venous thromboembolism (18%). Over 60% of the patients were non-therapeutic with regard to their INR: 41% were subtherapeutic and 20% were supratherapeutic. Overall, hospital length of stay was significantly higher in those patients admitted on Warfarin (4 days vs. 3 days ($p < .0001$)). 128 (20%) of the patients had significant closed head injury (CHI) defined as AIS of 4 or 5. In those patients with severe CHI (AIS 4 or 5), pre-injury Warfarin use did increase in hospital mortality (23.7% vs. 12.5%; $p=.04$).

Conclusion: A significant number of trauma patients are admitted on Warfarin for inappropriate indications. Preinjury warfarin increased mortality in those patients with severe closed head injury. National safety initiatives directed at appropriate use of Warfarin are necessary.

BODY ADIPOSE CONTENT IS INDEPENDENTLY ASSOCIATED WITH A HIGHER RISK OF ORGAN FAILURE AND NOSOCOMIAL INFECTION IN THE NON-OBESE PATIENT POST INJURY

R. Edmonds, T. Billiar, A. Peitzman, A. Rosengart, J. Minei, J. Cuschieri, R. Maier, B. Harbrecht, J. Sperry
University of Pittsburgh Medical Center

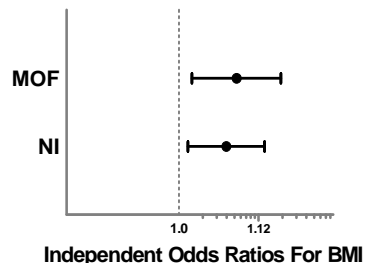
Presenter: Rebecca Edmonds, MD

Senior Sponsor: Jason Sperry, MD, MPH

Objective: Obesity defined by a Body Mass Index (BMI) $> 30 \text{ kg/m}^2$ is associated with increased morbidity and mortality following trauma. Evidence suggests that obesity represents a state of chronic inflammation and that the adipose tissue content may affect the intensity and resolution of inflammatory response. We sought to avoid of the confounding effects attributable to obesity and determine the association of BMI and outcomes following injury in non-obese patients.

Methods: Data were obtained from a multicenter prospective cohort study evaluating outcomes in blunt injured adults with hemorrhagic shock. Only patients with a BMI ≥ 18 and < 30 were analyzed. Those with isolated TBI, cervical cord injury and those who survived < 24 hrs were excluded. Logistic regression was used to evaluate the effects of BMI on mortality, multiple organ failure (MOF, MODS > 5) and nosocomial infection (NI) after adjusting for differences in demographics, injury severity, early resuscitation needs, shock parameters and comorbidities.

Results: Overall mortality, MOF and NI rates for the study cohort ($n=820$) were 13%, 37%, and 46%, respectively. Median ISS was 33 [IQR 22,41]. Median BMI for the study cohort was 25 [IQR 23,27]. As BMI increased (18-30), Maximum organ dysfunction scores also significantly increased for cardiac, respiratory and renal systems. Logistic regression revealed no significant association with mortality (OR 0.95, 95%CI 0.9-1.0), however, BMI was independently associated with a higher risk of MOF (OR 1.09, 95%CI 1.02-1.06) and NI (OR 1.07, 95%CI 1.01-1.13, figure). For every single point increase in BMI, the risk of MOF and NI increase by 9% and 7%, respectively.



Conclusion: The risk of MOF and NI increases as BMI increases in the non-obese injured patient. These results suggest that body adipose content may be associated with the magnitude of or extent of the inflammatory response post injury. Further studies are needed to elucidate the mechanism responsible for this association.

**ARE THE NEW 60'S REALLY THE OLD 40'S? THREE FRIENDS FOR THREE DECADES
ATTEMPT TO ANSWER THE QUESTION**

T. Cogbill, J. Cogbill, E. Moore, S. Moore, S. Shackford, E. Shackford
Scripps-Mercy, San Diego

Presenter: S. Shackford

Senior Sponsor: S. Shackford

For the past year, three senior WTA members (one in his late 50's and two in their early 60's) trained for and completed Ford Ironman Coeur D'Alene (2.4 mile swim, 112 mile cycle, 26.2 mile run). Endurance athletics of this magnitude can be particularly demanding and time consuming for senior athletes. Despite the challenges, all three found the experience to be very gratifying and enjoyable as a group effort. The presentation will include a discussion of the potential physiologic impediments to endurance events in seniors, mental preparation, physical training, nutrition, and balancing family and professional priorities with the addition of up to 20 hours of training per week.

IS EARLY VENOUS THROMBOEMBOLISM PROPHYLAXIS SAFE IN TRAUMA PATIENTS WITH INTRACRANIAL HEMORRHAGE?

D. Koehler, S. Fleming, J. Shipman, M. Davidson, O. Guillaumondegui
Vanderbilt University

Presenter: Daniel M. Koehler **Senior Sponsor:** John B. Holcomb

Background: Patients with traumatic brain injuries (TBI) are at high risk for venous thromboembolic sequelae. While pharmacological prophylaxis has been proven to be efficacious in reducing the incidence of venous thromboembolism (VTE) in general trauma populations, TBI patients have been largely excluded from analysis. VTE prophylaxis is often delayed in the TBI population due to the perceived risk of exacerbating intracranial hemorrhagic injuries (IHI).

Hypothesis: In hemodynamically stable TBI patients, early VTE prophylaxis is not associated with increased progression of IHI.

Methods: This is a retrospective cohort study from a Level 1 Trauma Center, from July 2004 to June 2008, of TBI patients and VTE prophylaxis. Inclusion criteria: received early (0-72hrs) or late (>72hrs) VTE prophylaxis (based upon a practice management guideline change to early VTE prophylaxis in July 2006), evidence of acute intracranial hemorrhage on admission head CT, H/N AIS ≥ 3 , age ≥ 16 years, hospital LOS ≥ 72 hrs. Exclusion criteria: ICP monitor or ventriculostomy, systemic anticoagulation prior to admission, pregnancy, coagulopathy, history of DVT, ongoing intra-abdominal hemorrhage 24 hours post-admission, and previous IVC filter placement. Demographic data, severity of illness and other trauma risks for VTE were collected. Progression of IHI is defined as lesion expansion or a new IHI on follow-up head CT scan. Statistical analysis via Pearson chi squares, Wilcoxon, and Kruskal-Wallis tests.

Results: 669 patients were identified: early 268 (40.1%), late 401 (59.9%). Average ISS was 27.83 ± 10.18 and 29.37 ± 11.01 for early and late groups. AIS H/N scores of 3 (47% vs. 34%), 4 (42% vs. 46%), 5 (11% vs. 19%), and 6 (0% vs. 1%) for early vs. late respectively. The average time of VTE prophylaxis was 2.77 ± 0.49 days and 5.31 ± 1.97 days for early and late groups. IHI progression before prophylaxis was 12.3%(early) vs. 22.4%(late) ($p < 0.001$). IHI progression after prophylaxis was 1.9%(early) vs. 2.0%(late) ($p > 0.9$). Proportions of proximal DVT and pulmonary embolism (PE) were 1.5% vs. 3.5% ($p = 0.117$) and 1.5% vs. 2.2% ($p = 0.49$) for early vs. late prophylaxis groups, respectively. There were no differences in ISS, age, pelvic and/or long bone fractures noted between the two groups.

Discussion: We found no evidence that early VTE prophylaxis increases the rate of IHI progression. The natural rate of IHI progression observed is comparable to previous studies. While this study was not powered to detect significant differences in the incidence of DVT and PE between the two study arms, the data trends toward increased proportions in both VTE outcomes in the late treatment group as has been noted in the current literature.

POINT: COUNTERPOINT I

THE PA CATHETER! TOO SOON ABANDONED?

**Michael West
University of California, San Francisco**

**Kimberly Davis
Yale School of Medicine**

A LEG TO STAND ON: THE RACIAL ODDS FOR AMPUTATION RATIO (ROAR) IN TRAUMATIC LOWER EXTREMITY FRACTURES

D. Weber, D. Shoham, R.L. Reed, F. Luchette
Loyola University Medical Center

Presenter: Daniel Weber

Senior Sponsor: R. Lawrence Reed, II, M.D.

Objective: Recent studies have concluded that black patients with metastatic colorectal cancer and lower extremity vascular disease receive substandard care compared to case matched white patients. The purpose of this study was to evaluate the effect of race on the management (salvage vs. amputation) of traumatic lower extremity open fractures.

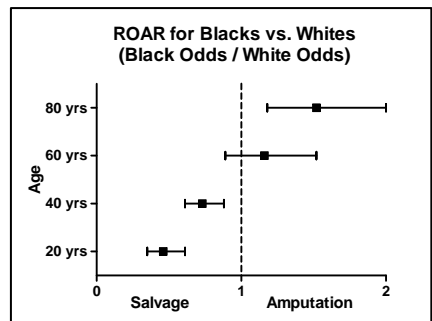
Methods: Data analysis was conducted using the American College of Surgeon’s National Trauma Data Bank (NTDB v4.0). Open femoral (OFF), tibial, and fibular (OTFF) fractures were identified by ICD9 and AIS codes. Injuries were identified as amputated based on the presence of one of three types of knee amputations (above the knee, below the knee, and knee disarticulation). Statistical analysis included logistic regression stratified for sex, age, race, mechanism of injury, severity, insurance type, and interaction between age and race.

Results: Of the more than 1.1 million patients in the NTDB, 10,082 OFF and 22,479 OTFF were identified, of whom whites (W) comprised 73%, blacks (B) 23%, Hispanics (H) 10%, and other races (O) 4%. Amputation rates were 3.1% for OFF and 4.2% for OTFF. Overall, whites had significantly higher odds of amputation for OFF (p=0.005) and OTFF (p=0.007) compared to B. However, this was primarily influenced by the larger number of young trauma patients. With age stratification, the ratio of amputation odds for blacks to amputation odds for whites (i.e. the Racial Odds for Amputation Ratio [ROAR]) demonstrated a significant interaction between black race and age in both the OFF (p=0.028) and OTFF (p=0.008) groups. In younger patients, a lower ROAR (p=0.016) favored salvage in B, while the ROAR in older patients favored amputation in B (p=0.013). The higher prevalence of penetrating injuries in B only accounted for 12.7% of the lower ROAR among younger adults.

Age	Probability Amp in B	Probability Amp in W
20-39	1.4 %	4.1 %
40-59	2.0 %	5.1 %
60-79	6.1 %	3.7 %
80 +	3.3 %	2.3 %

demonstrated a significant interaction between black race and age in both the OFF (p=0.028) and OTFF (p=0.008) groups. In younger patients, a lower ROAR (p=0.016) favored salvage in B, while the ROAR in older patients favored amputation in B (p=0.013). The higher prevalence of penetrating injuries in B only accounted for 12.7% of the lower ROAR among younger adults.

Conclusion: There exists a racial disparity in management of lower extremity open fractures. Older blacks have greater odds favoring amputation that is not explained by mechanism. In contrast, younger blacks appear to have lower odds for amputation that is only partially explained by mechanism of injury.



IMPACT OF GENDER ON VENTILATOR – ASSOCIATED PNEUMONIA OUTCOME FOLLOWING TRAUMA

S. Berry, L Magnotti, B. ZaurZaur, P. Fischer, J. Swanson, P. Clement, T. Schroepel, T. Fabian, M. Croce
University of Tennessee Health Science Center

Presenter: Stepheny D. Berry, M.D.

Senior Sponsor: Ben L. Zarzaur, M.D., M.P.H.

Background: Gender alone offers no survival advantage in humans following trauma. However, male gender does predict increased morbidity, specifically ventilator-associated pneumonia (VAP). Previous work has shown that despite lower incidence of VAP, females with VAP have increased mortality. The purpose of this study was to evaluate the impact of VAP and gender on outcome and determine which risk factors for severe VAP predict mortality in trauma patients.

Methods: Patients with VAP ($\geq 10^5$ CFU/mL in BAL) over 48 months were stratified by gender, age, severity of shock and injury severity. Risk factors for severe VAP were defined as multiple episodes (ME), polymicrobial (Poly), multi-drug resistant (MDR), early VAP (diagnosed within 7 days) with nosocomial organisms (eNVAP), and multiple inadequate empiric antibiotic therapy (mIEAT) episodes. Mortality and severe VAP risk factors were compared using chi-square analysis. Multivariable logistic regression (MLR) was performed to determine which VAP factors were independent predictors of mortality.

Results: 393 patients were identified: 309 (79%) men and 84 (21%) women. Despite a higher incidence of VAP among males (3.5% vs 2.5%, $p = .01$), mortality

	Poly	MDR	eNVAP	mIEAT
Males	29%	13%	4%	5%
Females	41%	30%	12%	11%
P	.033	.0001	.006	.039

was higher in females (23% vs 12%, $p = .008$). All risk factors for severe VAP were increased in females (Table) with the exception of ME ($p = .735$). MLR identified mIEAT episodes as an independent predictor of mortality in females with severe VAP after adjusting for age, penetrating injury, ISS, admission base excess, and massive transfusions (OR=16.9, $p=.0213$).

Conclusions: The fact that females develop less VAP but suffer increased mortality confirms previous studies. Risk factors for severe VAP are increased in females and may contribute to this observed mortality difference. MLR identified mIEAT episodes as an independent predictor of mortality in females with severe VAP following trauma.

OVER-RELIANCE ON CT IMAGING IN PATIENTS WITH SEVERE ABDOMINAL INJURY: IS THE DELAY WORTH THE RISK?

M. Neal, A. Peitzman, T. Billiar, G. Marshall, G. Watson, J. Sperry
University of Pittsburgh

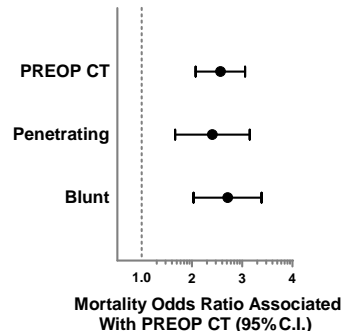
Presenter: Matthew D. Neal

Senior Sponsor: Jason L. Sperry

Background: Computed tomography (CT) has a high sensitivity and specificity for detecting abdominal injuries. Expeditious abdominal imaging in 'quasi-stable' patients may prevent negative laparotomy. However, the significance of potential delay to laparotomy secondary to abdominal imaging remains unknown. We sought to determine whether the use of abdominal CT in patients with abdominal injury requiring laparotomy results in a significant delay and a higher risk of poor outcome.

Methods: A retrospective analysis of data from the National Trauma Data Bank (NTDB version 7.1) was performed. Inclusion criteria were adult patients (age > 14 years), a scene admission (non-transfer), initial hypotension upon arrival (ED SBP <90 mmHg), an abdominal AIS score > 3, and undergoing a laparotomy within 90 minutes of arrival. Patients with severe brain injury (head AIS > 3) were excluded. The independent mortality risk associated with a preoperative abdominal CT (PREOP CT) was determined using logistic regression after controlling important confounders.

Results: This cohort of patients (n=3,218) was significantly injured with a median ISS of 25 [IQR 16,34]. PREOP CT patients had higher GCS scores, a lower mean head AIS, longer time delays to laparotomy, and a higher crude mortality (45% vs 30%, p=0.001). Logistic regression revealed that PREOP CT was independently associated with over a 2-fold higher risk of mortality (OR 2.14, p=0.001, Figure). When stratified by injury mechanism, the mortality risk remained significantly elevated for both subgroups. When laparotomy was within 30mins from arrival, PREOP CT was associated with over a 6-fold higher risk of mortality.



Conclusion: This data suggests delay secondary to over reliance on abdominal CT in patients who require laparotomy results in a higher risk of mortality. CT is an essential tool for patients with abdominal injury and possible

Presidential Address

“Service”

Robert C. Mackersie, M.D.



THE UNIQUE PATTERN OF COMPLICATIONS IN ELDERLY TRAUMA PATIENTS AT A LEVEL 1 TRAUMA CENTER

S. Adams, B. Cotton, E. Dipasupil, J. Podbielski, A. Zaharia, J. Smith, D. Ware, B. Gill, R. Albarado, R. Kozar, E. Gonzalez, J. Duke, P. Adams, C. Dyer, J. Holcomb
 University of Texas Health Science Center at Houston

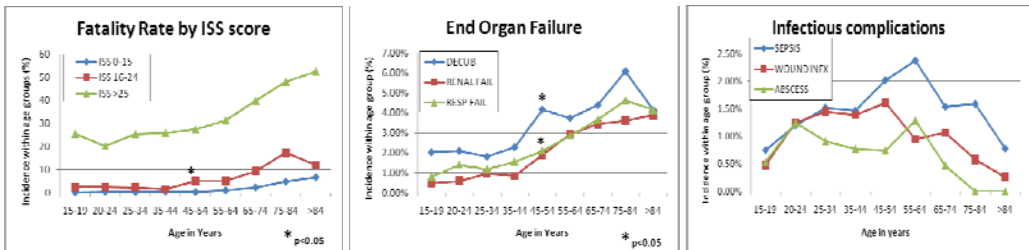
Presenter: Sasha Adams, M.D.

Senior Sponsor: John Holcomb, M.D.

Background: As the population ages, trauma centers have seen an increased proportion of elderly patients presenting with major injury. There is a well known relationship between increased age and ISS with increased mortality. Most trauma centers and trauma care were originally designed to care for seriously injured young patients, and we feel that the special needs of the elderly patients are therefore not being adequately addressed. This unique group may require modification of standardized guidelines in collaboration with geriatric specialists. Before modifying our treatment protocols we wondered how complications would differ between age groups. We hypothesize that elderly patients would have different complications than their younger counterparts.

Method: We queried our trauma database for adult patients admitted to our Level I trauma center over the last 4 years, and divided them into 9 age groups. We compared ISS, mechanism, mortality, and the incidence of 10 complications, both individually and categorized into three broad groups: end organ failure, infections, and thrombo-embolic complications. Comparisons were made among the 9 age groups by univariate as well as non-parametric trend analysis.

Results: Of the 15,223 patients, 13% were elderly (≥ 65), and 86% were injured via a blunt mechanism. Increasing age correlated with fatality (for all ISS scores), end-organ failure and thrombo-embolic complications (DVT and coagulopathy). Analysis revealed a significant breakpoint at 45y of age for mortality, decubiti and renal failure (all p-values <0.05). Infectious complications (sepsis, wound infection and abscess) all peaked between 45-65y old, then steadily declined with progressive age.



Conclusion: Previous authors have described the relationship between increased injury severity, age and mortality. We document that elderly trauma patients suffer the same complications as their younger counterparts, but at a different rate. More importantly, we identified that the “breakpoint” for increased risk of both complications and mortality appears to be as young as 45 years of age. The mechanisms behind these observations are unknown. Knowing these unique patterns of preventable complications will allow appropriate allocation of resources and help focus research efforts, resulting in interventions that should improve outcomes.

**DEFINING THE LIMITS OF RESUSCITATIVE EMERGENCY DEPARTMENT THORACOTOMY;
A CONTEMPORARY WESTERN TRAUMA ASSOCIATION PERSPECTIVE**

E.E. Moore, M.M. Knudson, C.C. Burlew, K. Inaba, R.A. Dicker, W.L. Biffi, A.K. Malhotra, K.L. Kaups, T.D. Browder, R. Coimbra, J.M. Haun, E.A. Gonzalez, D.H. Livingston and the WTA Study Group
Western Trauma Association Study Group

Presenter: Ernest E. Moore, M.D.

Senior Sponsor: Ernest E. Moore, M.D.

Since the promulgation of ED thoracotomy > 40 yrs ago, there has been an ongoing search to define when this heroic resuscitative effort is futile. In this era of health care reform, generation of accurate data is imperative for developing patient care guidelines. The purpose of this prospective multicenter study was to identify injury patterns and physiologic profiles at ED arrival that are incompatible with survival. Methods Eighteen institutions representing the Western Trauma Association commenced enrollment in January 2003; data were collected prospectively. Results During the ensuing 6 years, 56 patients survived to hospital discharge. Mean age was 31.3 (15-64 yr) and 91% were male. As expected, survival was predominately in those with thoracic injuries (77%) followed by abdomen (9%), extremity (9%), neck (4%), and head (2%). The most common injury was a ventricular SW (29%). 11% of survivors sustained blunt trauma, 34% underwent prehospital CPR, and the BD was > -25 in 20 %. Relevant to futile care, there were survivors of penetrating torso injuries with CPR up to 15 min and blunt torso injuries up to 10 min. Asystole was documented at ED arrival in 12%; all these patients had pericardial tamponade and 4 (57%) had complete neurologic recovery. Conclusion Resuscitative thoracotomy in the ED is futile care when: a) prehospital CPR exceeds 10 min following blunt trauma, b) prehospital CPR exceeds 15 min following penetrating trauma, and c) asystole is the presenting rhythm and there is no pericardial tamponade.

THE USE OF CONTRAST ENHANCED ULTRASOUND FOR EVALUATION OF SOLID ORGAN INJURY IN PATIENTS WITH BLUNT ABDOMINAL TRAUMA

J. Mihalik, A. Putnam, J. Foster, S. Smith
Virginia Tech Carilion School of Medicine

Presenter: Jennifer E. Mihalik, M.D.

Senior Sponsor: R. Stephen Smith, M.D.

Background: The evaluation and management of blunt abdominal trauma is primarily nonoperative. Modalities currently used to evaluate the abdomen include the focused assessment with sonography for trauma (FAST) diagnostic peritoneal lavage (DPL), and computed tomography (CT). Previous attempts to identify specific solid organ injury with ultrasound have been unsatisfactory. The use of perflutren lipid microsphere (Definity) contrast enhanced ultrasound (DUS) may provide an additional modality for evaluation of solid organ injury with decreased risk of radiation exposure and contrast related complications.

Methods: After gaining IRB approval, injured patients admitted to a state designated Level 1 trauma center (1/2008 – 7/2009) that showed evidence of solid organ injury on initial CT were eligible for entry into the study. Patients that gave consent to enter the study and were without contraindications to Definity underwent ultrasound examinations with and without contrast enhancement within 12 hours of the initial CT. Ultrasound images were then compared to CT findings for organ injury, size and grade of injury. Surgical sonographers were blinded to specific CT findings.

Results: Twenty patients with evidence of solid organ injury on CT were evaluated with DUS. Of 8 liver lesions, DUS correctly identified 5. DUS correctly identified all 9 of the splenic lesions. Of the 2 kidney injuries, 1 was correctly identified. Overall, the positive predictive for all solid organ injuries was 100%,. The overall sensitivity for DUS was 78.9%, and the specificity was 100%. Overall accuracy of DUS was 80%. One patient was scanned for free fluid, and subsequently found to have a bladder rupture, but no solid organ injury noted on CT or DUS.

Conclusions: Contrast enhanced sonography is a potential new modality for the evaluation of solid organ injury in patients with blunt abdominal trauma. In patients without known contraindications, DUS may provide a safe and accurate alternative to CT.

OPEN FRACTURES: IMPACT OF DELAY IN OPERATIVE DEBRIDEMENT AND IRRIGATION

A. Malhotra, N. Martin, N. Willis, R. Mounasamy, T. Duane, M. Aboutanos, K. Guilford, J. Whelan, J. Mayglothing, R. Ivatury
Virginia Commonwealth University

Presenter: Ajai Malhotra

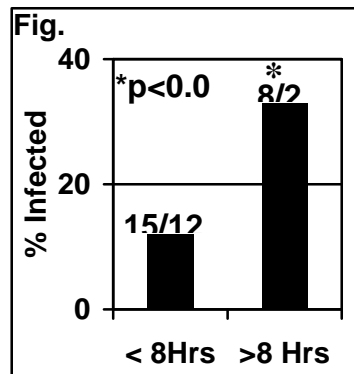
Senior Sponsor: Ajai Malhotra

Background: Early (< 8-hours) operative debridement and irrigation (Op D&I) of open fractures has been considered essential to reduce the risk of deep infection. With the advent of powerful antimicrobials this axiom has been challenged. The current study evaluates the rates of deep infections of open fractures in relation to the time to first Op D&I.

Methods: A list of all blunt open lower extremity fractures was obtained from the trauma registry. Patients were evaluated for age, degree of injury (ISS), degree of physiological derangement (SBP, Lactate, RTS), and type of fracture (Gustilo). Time to first Op D&I was calculated. All patients received appropriate prophylactic antimicrobials at presentation. Infection rates were calculated and correlated to the time to first Op D&I. Significance was set at $p < 0.05$.

Results: Over the 42-month study period, 148 patients presented with blunt open lower extremity fractures. The presentation characteristics are shown in Table. The groups were well matched though the ISS in the >8-hour group was higher.

Table	Time to first Op D&I		p value
	<8-hours (n=124)	>8-hours (n=24)	
Age (years)	42±1.5	36±2.7	NS
ISS	12±0.7	18±2.3	<0.05
RTS	7.7±0.9	7.8±0.0	NS
SBP (mmHg)	138±2.7	126±3.5	NS
Lactate (µmol/L)	2.2±0.3	2.4±0.4	NS
Gustilo type			NS
I	14 (11%)	4 (17%)	
II	45 (36%)	7 (29%)	
III	65 (53%)	13 (54%)	



The group with >8-hours to first Op D&I had significantly higher rate of deep infection (8/24 – 33%) as compared to the group with <8-hours to first Op D& I (15/124 – 12%) – Fig. ($p < 0.05$).

Conclusions: Delay of >8-hours to first Op D&I of lower extremity open fractures is associated with higher rates of deep infection, despite early use of appropriate prophylactic antimicrobials.

ADAPTATION: THE KEY TO FAMILY SURVIVAL DURING MILITARY DEPLOYMENT

Gary A. Vercruysse
Emory University Department of Surgery

Presenter: Gary A. Vercruysse

Senior Sponsor: Gary A. Vercruysse

Of the many hardships my family would endure in my absence. Besides tending to the obvious (updated wills, putting finances in order, automatic bill payment, forwarding address, promises from relatives and neighbors to care for my family), we began a five month journey into unfamiliar territory centered around adapting to the stresses of separation.

Rather than sulking, my children developed an aggressive sense of civic responsibility in dealing with my time away. Alec (then 8), and Claire (10) both became extremely involved in writing to and collecting and sending care packages of second hand clothing, shoes and essentials for Iraqi children. When they received letters or pictures from children wearing or using items they had sent, both were visibly proud. They wrote to me explaining that they understood why I was there, and felt that they were trying to do their best to help those in a bad situation.

In addition to being a mom, my wife spent my deployment being a dad too. She was responsible for all child and home responsibilities as well as attending all soccer games, swim meets, dance classes, and school recitals. She also dealt with a number of impending home disasters. Catherine related her frustrations at times, but always solved problems and became perhaps more independent than she'd ever been. This developed ability has since been exploited by me and used to her advantage on several occasions.

I worked as much as possible to avoid loneliness during my deployment. Life was like one long call night. As time passed I found myself becoming enmeshed with the children for whom I was caring. They, and those around me, became a surrogate family. Waiting for a planned family reunion was similar to the delayed gratification of fellowship training. For me, family life was on hold in Iraq.

Although each of us dealt with separation differently, adaptation made time pass quicker. I'm proud to say that we are a stronger family now than before "our" deployment.

8:30 a.m., 3/3/10

POINT: COUNTERPOINT II

**DAMAGE CONTROL (1:1:1) HEMOSTATIC RESUSCITATION: A PROVED
CONCEPT?**

**John B. Holcomb
University of Texas Health Science Center**

**E.E. Moore
Denver Health Medical Center/University of Colorado**

CARDIOPULMONARY RESUSCITATION IN THE FIELD: A BATTLE WORTH FIGHTING FOR?

R.C. Mooty, K. Olivera, A. Mangram, E. Dunn
Methodist Health Systems

Presenter: R. Clark Mooty, M.D.

Senior Sponsor: Alicia Mangram, M.D., FACS

Guidelines for withholding or termination of resuscitation have been published in the Journal of the American College of Surgeons. These guidelines support the withholding of resuscitation efforts on any blunt trauma patient found to be apneic, pulseless, and without organized ECG activity at the scene. Recommendations also consider termination of resuscitation efforts after fifteen minutes of unsuccessful cardiopulmonary resuscitation (CPR). We report a case of blunt trauma with prolonged CPR in the field and a profound base deficit, who survived with no significant physical or neurologic deficits.

Case Report: A 17 year-old female presented to our emergency department (ED) after involvement in a motor vehicle collision. The patient was found pulseless in the field and underwent fifteen minutes of CPR, after which she regained pulses. Upon arrival to the ED, the patient was hemodynamically unstable with a base deficit of 23. ATLS management allowed enough clinical stabilization for necessary imaging to be done. Radiologic evaluation noted a traumatic tear of the proximal descending aorta with pseudoaneurysm and active hemorrhage, a seven centimeter liver laceration with hematoma, a left hemothorax, a right hemopneumothorax with associated rib fractures, as well as left ischial, left acetabular, and bilateral pubic rami fractures. Computed tomography of the brain and cervical spine did not show any evidence of traumatic injury. Given the above findings, vascular surgery emergently took the patient to the operating room and performed an endovascular aortic repair with stent graft and placement of bilateral tube thoracostomies. Due to concerns of bleeding from the liver laceration and/or pelvic fractures, the aortic stent was managed without post-surgical anticoagulation. Both the liver and pelvis were successfully treated non-operatively. Although multiple negative neurologic imaging was obtained, the patient remained in a coma requiring a tracheostomy and gastrostomy. Despite the magnitude of her injuries and the severity of her presenting condition, the patient clinically improved and on hospital day 34 was discharged home neurologically intact, no longer requiring a tracheostomy or gastrostomy. The patient has been followed in the outpatient clinic and has returned to her pre-operative status.

Discussion: It is well cited that patients who have cardiac arrest after blunt trauma have a poor survival. The few who do survive CPR commonly have significant neurologic impairment. Studies also show extreme base deficits (>20) in blunt trauma patients to have a high mortality. We are able to present a rarity to all of the above – a battle that was worth fighting for.

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”.

“Meditation on Mortality: Lessons from a Life in Surgery”

William Schechter, M.D.



AN ASSESSMENT OF PATIENT SATISFACTION WITH NON-OPERATIVE MANAGEMENT OF CLAVICULAR FRACTURES USING THE DASH OUTCOME MEASURE

T. Thormodsgard, D. Ciraulo, K. Stone
Maine Medical Center

Presenter: T. Thormodsgard

Senior Sponsor: D. Ciraulo

Introduction: Clavicular fractures historically have been managed with out internal fixation. Current literature is raising question regarding this management now offering internal fixation as an option. This study addresses the use of the Disabilities of the Arm, Shoulder, and Hand (DASH) Outcomes measure and variation in fracture location based upon Allman Classification to identify those that are least satisfaction with non operative care of the clavicular fracture.

Methods: 653 patients having suffered clavicular fractures were mailed the DASH Outcomes Measure to be completed and returned. A total of 113 surveys were returned completed and of value for evaluation. Patients chest X-rays were evaluated and measurements made of the clavicular fractures for degree of separation or shortening and grade according to Allman Classification. Statistical evaluation was completed comparing DASH Scores (patient satisfaction as outcome measure) to the Allman Classification and the degree of separation or shortening. Comparison of categorical variables were performed using Fisher's exact test and for continuous variables using Student's t-test. Statistical significance was demonstrated by a p value of less than 0.05.

Results: Patients with the greatest degree of shortening greater than 2 cm were found to have the highest DASH score indicating dissatisfaction and disability with their outcome post injury ($p = 0.0001$). Separation or lengthening appeared to be associated with lower DASH Scores. Patients with Allmen Classification I (middle clavicular shaft) had higher DASH score than other fracture locations. ($p = 0.0001$).

Conclusions: Patients with mid shaft clavicular fractures with shortening of greater than 2 cm may be good candidates for operative repair given the degree of dissatisfaction with non operative management of these fractures as assessed by long term outcome measures of disability.

PEDIATRIC RADIATION EXPOSURE DURING THE INITIAL EVALUATION FOR BLUNT TRAUMA

D.L. Mueller, M.R. Hatab, C. Brougher, R. Al-Senan, M.G. Corneille, D.L. Dent, J.G. Myers, R.M. Stewart, S.E. Wolf, S.M. Cohn
University of Texas Health Science Center at San Antonio

Presenter: Deborah L. Mueller, M.D.

Senior Sponsor: Steven E. Wolfe, M.D.

Introduction: Increased utilization of computed tomography (CT) scans and radiation dose in blunt trauma evaluation have increased over time. Radiation dose is relatively amplified in children secondary to body size, and children are more susceptible to long term carcinogenic effects of radiation. Our aim was to measure radiation dose received in pediatric patients during initial CT evaluation for injury.

Methods: A prospective cohort study of pediatric blunt trauma patients ages 0-17 was conducted over 6 months at a Level 1 trauma center. Dosimeters were placed on the neck, chest, and groin prior to CT scanning to measure surface radiation. Patient torso length and chest circumference as well as scanning parameters including tube voltage, scanning time, and CT dose index were prospectively recorded to allow calculation of cumulative effective whole body dose. CT scans were classified by presence or absence of traumatic injuries.

Results: Complete dosimeter and CT scanning data were available for analysis in 199 patients. The total number of CT scans obtained in the study population was 618, for a mean number of 3.13 ± 1.32 CT scans per patient. Injuries were detected in 25% of scans. Positive scans by body region were: 34% of head, 4% of neck, 70% of face, 23% of chest and 25% of abdomen/pelvis images. Mean whole body effective dose was 19.62 ± 13.5 millisieverts (mSv). This mean dose is equivalent to 6.5 years of background radiation dose in the US or 1,962 chest X-rays. Performing more than two scans resulted in a six fold increase in the radiation dose $p < 0.001$ (see Table).

# of CTs	Patients	Neck (mGy)	Chest (mGy)	Groin (mGy)	Effective Dose (mSv)
≤ 2	63	7.48 ± 10.15	2.75 ± 4.98	1.79 ± 4.98	5.87 ± 5.80
> 2	136	26.21 ± 14.31	20.1 ± 11.17	12.08 ± 6.13	25.99 ± 11.09

Conclusions: Whole body effective radiation doses received by children during trauma evaluation fall within the low to medium dose risk range for development of thyroid cancer based upon epidemiologic studies. Dose was reduced six fold if less than 3 body regions are imaged by CT during pediatric trauma assessment. Extensive scanning should only be used when clinically appropriate to avoid excess radiation exposure.

GENDER DIMORPHISM IN THE GUT FOLLOWING SHOCK: MUCOSAL PROTECTION BY ESTROGEN STIMULATION OF IGA TRANSCYTOSIS

M.Diebel, D Liberati, L Diebel
Wayne State University

Presenter: M. Diebel

Senior Sponsor: L. Diebel

Introduction: Laboratory and some clinical studies demonstrate gender dimorphism following trauma/hemorrhagic shock (T/HS). These differences have been attributed to estrogen (E2) levels. Preservation of gut barrier function by E2 following T/HS has been recently described. However the mechanism(s) are not clear. The principle humoral defense mechanism of the gut is provided by secretory IgA (sIgA). It is transported across intestinal epithelial cells (IEC) by a specific transmembrane protein receptor (polyimmunoglobulin receptor, pIgR). Transport of IgA (transcytosis) may be influenced by a number of factors. We postulated that there may be differences in IgA transcytosis and IEC pIgR expression in response to sex hormones. We studied this *in vitro*.

Methods: Confluent HT-29 IEC monolayers were established in a two chamber cell culture system. E2 or dihydrotestosterone (DHT) was added for 72 hours prior to the start of experiments. Dimeric IgA (dIgA) was then added to the basal chamber (4°C, to obtain maximal pIgR binding of dIgA). The cell cultures were returned to 37°C and apical media sampled at intervals for sIgA. Apical chamber sIgA was quantitated by ELISA. pIgR expression in HT-29 cells was determined by flow cytometry and indexed as mean fluorescence intensity (MFI). Monolayer integrity was confirmed by serial measurement of transepithelial electrical resistance (TEER).

Results: Apical chamber sIgA (mean \pm SD, N = 3 for each group)

	IgA Transcytosis (pg/ml)		pIgR Expression (MFI)
	3hr.	12hr.	
Control	3.7 \pm 1.1	12.8 \pm 1.8	51.2 \pm 3.6
0.01 μ M E2	10.5 \pm 2.3*#	24.3 \pm 2.0*#	57.1 \pm 4.5
0.10 μ M E2	17.9 \pm 1.6*#	30.8 \pm 2.6*#	58.8 \pm 4.2
1.0 μ M E2	26.6 \pm 2.8*#	50.4 \pm 3.8*#	99.3 \pm 5.6*#
0.01 DHT	3.7 \pm 1.1	11.8 \pm 2.0	46.9 \pm 1.6
0.10 DHT	4.2 \pm 0.9	14.2 \pm 2.2	49.3 \pm 1.3
1.0 DHT	5.0 \pm 1.5	15.7 \pm 1.7	52.6 \pm 2.6

*p<0.001 vs. Control, #p<0.001 vs. DHT at same concentration

Conclusion: IgA transcytosis was increased by E2 in a dose related fashion. This effect was due to augmented intracellular trafficking of IgA and to a lesser extent increased pIgR expression. Preservation of gut mucosal barrier function by E2 following T/HS may be due to it's salutary effects on humoral immune defenses. The dose related effects of E2 on IgA transport confirm the findings in animal studies that improved outcomes in females can be related to the estrus cycle.

UNUSUALLY LARGE TRAUMATIC RIGHT DIAPHRAGMATIC HERNIA IN ASSOCIATION WITH A CONGENITAL CLEFT ON THE LIVER PRESENTING 10 YEARS AFTER A MOTOR VEHICLE CRASH: A CASE REPORT

A. Wissel
Legacy Emanuel Medical Center Trauma Service

Presenter: Amanda Wissel, RN

Senior Sponsor: William Long, MD

Traumatic diaphragmatic hernias can occur from blunt or penetrating torso trauma. 24.4 % of all trauma diaphragmatic hernias occur on the right. There are no reports of a traumatic right diaphragmatic hernia in association with a rare congenital cleft of the liver.

We present the case of a 41-year-old Hispanic male who came to our emergency department with pancreatitis. An abdominal cat scan revealed a huge right diaphragmatic hernia, probably occurring ten years earlier after a motor vehicle crash in Mexico. The gastric antrum, pylorus, entire duodenum, the head of the pancreas, proximal small bowel, and transverse colon had herniated through and behind a congenital cleft in the liver to enter the right chest, compressing the lower lobe of the right lung. Further diagnostic tests revealed anomalous venous drainage of the hepatic veins into the inferior vena cava, and stretching of the right hepatic bile duct, portal vein and hepatic artery over the herniated abdominal contents.

Surgical repair was accomplished by laparotomy, reduction of the hernia and repair of the right diaphragm. Follow-up radiography revealed normal gastrointestinal anatomy and the re-expanded right lung.

SUPERIOR MESENTERIC VEIN AVULSION FROM BLUNT ASSAULT: A RARE AND POTENTIALLY LETHAL INJURY

B. Joseph, B. Madigan, L. Lucas, N. Kulvatunyou, R. Friese, T. O'Keefe, J. Wynne, J. Hughes, J. Mills, R. Latifi, P. Rhee
The University of Arizona

Presenter: Brian Madigan

Senior Sponsor: Peter Rhee

Superior mesenteric vein (SMV) injuries from blunt injuries are rare as they are usually fatal. The following case report illustrates successful management of a 40-year-old male who suffered this injury after a blunt assault. This patient arrived to our Level 1 Trauma center after being assaulted by a former green beret. The patient had peritonitis and a positive fast exam and thus the patient was taken immediately to the operating room where we identified injury to the SMV across the confluence of the splenic and portal vein. The patient was also found to have contaminant splenic and large bowel mesenteric injuries. Procedures included primary repair of the SMV by partially transecting the neck of the pancreas and splenectomy and right hemi-colectomy. Patient required a large number of transfusions and our mass transfusion protocol was used. After damage control laparotomy the patient was taken to the ICU for further resuscitation. The second look operation revealed a thrombosed SMV repair and edematous bowel. Embolectomy and reconstruction of the SMV was performed using the superficial femoral vein as a conduit. The patient's bowels which were congested responded immediately to restoration of venous outflow. Following restoration of gastrointestinal passage the patient was discharged in good health. We report this case to show that the bowels can be salvaged after SMV thrombosis. We found that the superior femoral vein is an excellent conduit for major abdominal vascular injuries.

8:20 am, 3/4/2010

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.

War and Peace at the Mucosal Surface: A Toll-Story Lawrence Diebel, MD



DEVELOPMENT AND TESTING OF LOW VOLUME, HYPERTONIC, HYPERONCOTIC, SPRAY-DRIED PLASMA FOR THE REVERSAL OF TRAUMA-ASSOCIATED COAGULOPATHY

F. Shuja, E. Fukudome, R. Finkelstein, M. Duggan, T. Kheirbek, T. Fischer, G. Velmahos, M. de Moya, D. King, H.B. Alam
 Massachusetts General Hospital/Harvard Medical School, Boston, MA

Presenter: Hasan B. Alam, M.D.

Senior Sponsor: Hasan B. Alam, M.D.

Introduction: Trauma-associated coagulopathy (TC) carries an extremely high mortality. Fresh frozen plasma (FFP) is the mainstay of treatment; however, its availability in the battlefield is limited. We have already shown that lyophilized, freeze-dried plasma (FDP), reconstituted in its original volume can reverse TC. To enhance the logistical advantage (lower volume and weight), we developed and tested a hyperoncotic, hyperosmotic spray-dried plasma (SDP) product.

Methods: Plasma separated from fresh porcine blood was either stored as FFP or preserved as FDP and SDP. In-vitro testing: SDP was reconstituted in distilled water which was either equal (1xSDP) or one-third (3xSDP) the original volume of FFP. Analysis included measurements of prothrombin time (PT), partial thromboplastin time (PTT), fibrinogen levels, and activity of selected clotting factors. In-vivo testing: Swine were subjected to polytrauma (femur fracture, grade V liver injury) and hemorrhagic shock (60% arterial hemorrhage, with “lethal triad” of acidosis, coagulopathy and hypothermia), and treated with FFP, FDP, or 3xSDP (n=4-5/group). Coagulation profiles (PT, PTT, thromboelastography) were measured at baseline (BL), post-shock (PS), post resuscitation (PR), treatment (M0), and during 4 hours of monitoring (M 1-4).

Results: In-vitro testing revealed that clotting factors were preserved after spray-drying. The coagulation profiles of FFP and 1xSDP were similar, with 3x SDP showing a prolongation of PT/PTT (Table). Polytrauma/hemorrhagic shock produced significant coagulopathy, and 3xSDP infusion was as effective as FFP and FDP in reversing it (Figure displays the prothrombin time).

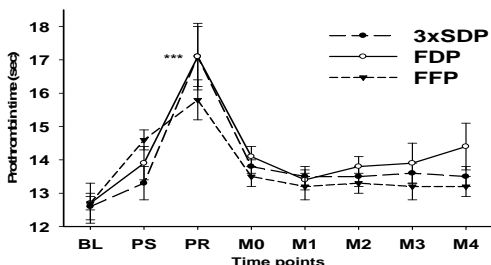


Table: In-vitro comparison. Clotting factor activity

Figure: In-vivo comparison of PT (sec).

shown as % of normal human activity (n=5/group) * = p<0.05 compared to baseline.

* = p<0.05 compared to FFP

Variable	FFP	1xSDP	3xSDP
PT(sec)	14±0.4	14±0.2	16.8±1*
PTT (sec)	28±2	26±2	41±5*
Fibrinogen (mg/dL)	84±8	83±6	245±11*
Factor II activity (%)	15±3	12±2	32±5*
Factor VII activity (%)	8.6±1	8±2	25±4*
Factor IX activity (%)	190±13	127±27	309±34*
Protein C (%)	56±2	51±5	51±2
Protein S (%)	10±0	10.2±0.2	13.4±1*

Conclusions: Plasma can be spray-dried, and reconstituted to one-third its original volume without compromising the coagulation properties in-vivo. This shelf-stable, low-volume, hyperoncotic, hyperosmotic plasma is a logistically attractive option for the treatment of trauma-associated coagulopathy in austere environments, such as a battlefield.

A PROSPECTIVE TRIAL OF DOMESTIC VIOLENCE SCREENING IN FEMALE INPATIENTS

L. Hewitt, B Havsar, H. Phelan

Parkland Memorial Hospital, UT-Southwestern Medical School, UT-Southwestern Medical Center
Department of Surgery

Presenter: Herb A. Phelan, MD **Senior Sponsor:** Hasan B. Alam, MD

Background: While intimate partner violence (IPV) is the leading cause of serious injury and the second leading cause of death among reproductive age women in America, effective screening is difficult. Our institution currently screens for IPV during the floor intake assessment by having a registered nurse (RN) ask three unscripted questions about physical, verbal, and sexual abuse during a battery of 81 questions. The patients are frequently in pain, medicated, distraught, or intoxicated and the RN is juggling multiple responsibilities. We also use a protocol-driven alcohol abuse screen on every trauma admission known as “Screening, Brief Intervention, and Referral for Treatment” (SBIRT). It is conducted by trained counselors when any effects of alcohol are gone in a distraction-free setting after patients have had time to ruminate on their admission. We hypothesized that linking the validated Partner Violence Survey (PVS) to SBIRT would result in higher rates of positive IPV screens than after RN screens.

Methods: This prospective trial was conducted at an urban Level I center. Female English and Spanish speaking trauma patients underwent the three-question, non-validated RN-screen upon floor arrival per the local standard of care. Prior to discharge, they then underwent SBIRT screening per trauma service protocol, after which SBIRT administered the PVS as our investigative intervention. All screens were native language. SBIRT screeners were blinded to the results of the earlier RN screen. If an SBIRT or RN screen was not performed for any reason, it was categorized as a negative screen. Admissions to the Surgical Intensive Care Unit (SICU) had both screens delayed until floor transfer. McNemar’s exact test was used for paired categorical data, and Fisher’s exact test otherwise. Significance was set at an alpha of 0.05.

Results: One hundred twenty five consecutive female inpatients (mean age 40.9 ± 17.7 yrs, ISS 9.8 ± 7.5) were enrolled, with 14 (11.2%) screening positive for one or both methods. The SBIRT-linked screen was significantly better at detecting IPV than the RN screen ($p=0.01$, table). No association was found between the likelihood of giving a discordant response to the two IPV screens and acute alcohol intoxication or polysubstance abuse at the time of

admission, being a Spanish-only speaker, or if the initial admission was directly to the SICU. Despite being mandatory on intake, 23 out of 125

patients (18.4%) had no RN-screen performed, with 2 of these patients screening positive for IPV by SBIRT personnel.

Conclusion: Linking an IPV screen to an established alcohol abuse screen results in higher rates of detection of IPV than screening by RNs at intake assessment. At our institution, adoption of this practice should result in detecting and referring approximately 85 additional female trauma inpatients per year for IPV services.

	SBIRT (+) screen	SBIRT (-) screen
RN (+) screen	3	1
RN (-) screen	10	111

STANDARD ENOXAPARIN DOSING MAY NOT PROVIDE ADEQUATE DRUG LEVELS FOR EITHER PROPHYLAXIC OR THERAPEUTIC THROMBOPROPHYLAXIS IN SERIOUSLY INJURED BURN PATIENTS

B. Potenza, B. Havsar, D. Lerner, G. Lew, J. Lee, J. Noordenbos, M. Tenenhaus, V. Bansal, J. Doucet, R. Coimbra
University of California San Diego

Presenter: B Potenza

Senior Sponsor: B Potenza

Introduction: Deep vein thrombosis (DVT) is a frequent complication associated with burn injury. Enoxaparin is an accepted modality for prophylaxis and treatment of DVT. 30 mg/kg q12 hours was administered for prophylaxis and 1 mg/kg daily of enoxaparin for therapeutic dosing.

Methods: Retrospective data from seriously injured burn patients was collected from 1/2006 to 9/2009. Anti X A levels were measured 4 hours after prophylactic and therapeutic dosing of enoxaparin. The target goal anti X a level for prophylaxis was (0.2-0.4 units/ml) and for therapy was (0.5 – 1 units/ml).

Results: 19 patients in the prophylactic group and 27 in the therapeutic group. Nine patients crossed over from the prophylactic group into the therapeutic group. Mean: age (42 years), TBSA (39%), REE (2630 calories) and GFR (>60 ml/min) did not differ significantly from the group that achieved the target goal vs. the group that did not achieve the target goal. Significant differences in mean anti X a levels exist within the prophylactic and therapeutic groups ($p < 0.001$).

Anti X a	Prophylactic (n=19)	Therapeutic (n=27)
n (total group)	19	27
range (total group)	(0.00-0.5)	(0.13-0.18)
mean (total group)	(0.18)	(0.57)
n (met target goal)	6/19(31.6%)	14/27 (51.9%)
range (met target goal)	(0.21-0.5)	(0.58-0.80)
mean (met target goal)	(0.29)	(0.66)
n (below target goal)	13/19(68.4%)	13/27(48.1%)
range (below target)	(0.0-0.17)	(0.13-0.48)
mean (below target goal)	(0.08)	(0.35)

Conclusions: The standard dose of either prophylactic or therapeutic enoxaparin may not reliably provide adequate anti-coagulation in patients with large surface area burns. There were no reliable clinical characteristics that could predict low anti X a levels. Enoxaparin use should be closely monitored with antiXa levels until further studies are done to identify factors affecting the enoxaparin pharmacokinetics in critically injured burn patients.

PANEL OF EXPERTS

Moderator: Tom Scalea, MD

Carl Hauser, MD

Carlos Brown, MD

Paul Harrison, MD

Karen Brazel, MD

RISK FACTORS FOR FAILED EXTUBATION IN TRAUMA PATIENTS

J Daigle, C Brown, K Foulkrod, B Brouillette, C Czysz, M Martinez, H Cooper
University of Texas Medical Branch - Austin University Medical Center Brackenridge

Presenter: J Daigle, MD **Senior Sponsor:** C Brown, MD

Introduction: After mechanical ventilation, extubation failure is associated with poor outcomes and prolonged hospital and ICU stays. We hypothesize that specific and unique risk factors exist for failed extubation in trauma patients.

Methods: 18-month (Jan 2008-June 2009) prospective, cohort study of all adult (≥ 18) trauma patients admitted to the ICU who required mechanical ventilation. Failure of extubation was defined as reintubation within 24 hours of extubation. Patients who failed extubation (failed group) were compared to those who were successfully extubated (successful group) in order to identify independent risk factors for failed extubation.

Results: There were 406 patients; 77 patients who underwent tracheostomy and 53 who died prior to extubation were excluded. The remaining 276 patients were 38 years old, 76% male, 84% sustained blunt trauma, with an average ISS = 21, GCS = 7, and systolic blood pressure = 125 mm Hg. Indications for initial intubation included airway (4%), breathing (13%), circulation (2%), and neurological disability (81%). A total of 17 (6%) patients failed extubation and failures occurred an average of 15 hours after extubation. After reintubation, the failed group required an additional 4 days of intubation and mechanical ventilation. The failed group was older (46 vs. 38, $p = 0.05$) and had a higher admission GCS (10 vs. 7, $p = 0.002$). Though there was no difference in ISS (24 vs. 21, $p = 0.40$), the failed group had more extremity (59% vs. 23%, $p = 0.007$) and spine (53% vs. 24%, $p = 0.007$) fractures. The failed group required more airway intubations (18% vs. 3%, $p = 0.003$) and fewer intubations for disability (59% vs. 82%, $p = 0.02$). The failed group had more complications including pneumonia (29% vs. 10%, $p = 0.14$), pleural effusion (29% vs. 10%, $p = 0.11$), and delirium tremens (47% vs. 7%, $p < 0.001$). Variables at extubation for the failed group and successful group included GCS (9 vs. 10, $p = 0.003$), heart rate (105 vs. 93, $p = 0.006$), systolic blood pressure (128 vs. 130, $p = 0.65$), hemoglobin (10 vs. 11, $p = 0.05$), O_2 saturation (94% vs. 96%, $p = 0.08$), pCO_2 (45 vs. 39, $p = 0.09$), pO_2 (144 vs. 200, $p = 0.16$), respiratory rate (23 vs. 18, $p = 0.14$), tidal volume in cc/kg (7 vs. 7, $p = 0.27$), and rapid shallow breathing index (35 vs. 32, $p = 0.33$). Independent risk factors to fail extubation included:

	Odds Ratio (95% CI)	p-value
Spine Fracture	5.5 (1.1 – 8.4)	0.04
Airway Intubation	2.2 (1.6 – 8.5)	0.004
GCS at extubation	1.4 (1.2 – 2.7)	0.005
Delirium Tremens	1.4 (1.2 – 7.4)	0.002

Patients who failed extubation spent more days in the ICU (11 vs. 6, $p = 0.006$) and hospital (19 vs. 11, $p = 0.002$). Mortality was 6% ($n = 1$) in the failed group and 0.4% ($n = 1$) in the successful extubation group.

Conclusions: Independent risk factors for trauma patients to fail extubation include spine fracture, initial intubation for airway, GCS at extubation, and delirium tremens. Patients with these risk factors may require additional interventions prior to extubation.

TRAUMA PATIENTS CAN BE MANAGED WITHOUT A SWAN-GANZ CATHETER WITH IMPROVED OUTCOME, BUT IT MAY BE BENEFICIAL IN SELECT PATIENTS

G. Barmparas C. Georgiou K. Inaba P. Hatjizacharia L. Chan D. Demetriades H. Belzberg R. Frieze P. Rhee

University of Southern California+Los Angeles County Medical Center and Arizona Health Sciences Center

Presenter: Galinos Barmparas

Senior Sponsor: Peter Rhee, MD, MPH

Objective: The purpose of this study was to document the changing pattern of PAC use at a level 1 trauma center and to examine the effect of PAC use on mortality.

Methods: The use of PAC was analyzed in patients > 16 years old admitted to the surgical intensive care unit (SICU) over a 9-year period starting in 2000. Patients with SICU length of stay exceeding 30 days were excluded. To examine outcomes associated with the use of PAC, PAC and no-PAC patients were matched utilizing a propensity score derived from all available covariates, including year of hospitalization.

Results: During the 9-year study period, a total of 4,592 patients met inclusion criteria. The mean age was 39.5 ± 18.8 years and the mean ISS was 19.9 ± 12.4 , with 31.5% of the study population having sustained a penetrating injury. PAC was utilized in 19.5% (n=896) of all patients admitted to the SICU. The trend for PAC use decreased significantly during the years, from 38.6% in the year 2000 to 4.2% in the year 2008 (p value for trend < 0.001). The PAC was utilized on average within the first 24 hours from admission in the time period 2000 to 2002, while in the time period 2006 to 2008 it was utilized on average on the 2nd post-admission day (p<0.036). Additionally, the duration of PAC utilization decreased significantly over time, from 4.1 to 3 days (p<0.001). Overall, patients with a PAC were significantly older, had sustained more frequently an injury due to a blunt mechanism, were more frequently hypotensive and comatose on admission, were more severely injured and were more frequently hospitalized in the time period 2000 to 2002. The propensity score matching algorithm successfully matched 719 patients receiving a PAC with 719 patients that did not. In this matched population, PAC patients had a higher overall mortality, when compared to the no-PAC group [34.2% vs. 22.5%, Odds Ratio (95% CI): 1.78 (1.42, 2.26), p<0.001]. Mortality was higher in the majority of tested subgroups of patients who received a PAC. However, for patients in the age group ≥ 70 years, the use of PAC did not affect mortality, independently of injury severity.

Conclusion: The use of PAC has decreased significantly over the last decade at a large, urban, level 1 trauma center and has been used more selectively, later during the ICU course and for a shorter time. In a matched population, the use of PAC is associated with a significantly higher mortality. Although the use of PAC appears to have a neutral effect on mortality of patients in the high extreme of ages (≥ 70 years), independently of the injury severity, a beneficial effect may have been lost due to confounding factors not accounted for in our analysis.

LONG – TERM FUNCTIONAL AND ECHOCARDIOGRAPHIC ASSESSMENT AFTER PENETRATING CARDIAC INJURY: FIVE YEAR FOLLOW-UP RESULTS

JA Carr, R Buterakos, WM Bowling, L Janson, KA Kralovich, C Copeland, R Link, C Roiter, G Casey, JW Wagner
Hurley Medical Center

Presenter: JA Carr

Senior Sponsor: R. Stephen Smith

Background: There is almost no data describing the long-term functional outcome of patients after penetrating cardiac injury.

Methods: A retrospective study at a Level 1 trauma center from 2000-2009.

Results: Sixty-three patients had penetrating cardiac injuries from 28 stabbings and 35 gunshots. Men comprised 89% (56) of the patients. Overall, there were 21 survivors (33%) and 42 died in the emergency room or peri-operative period. The mean age did not significantly differ between survivors (36 + 12 years) compared to those who died (30 + 11 years, $p = 0.07$). There was an increased chance of survival after being stabbed compared to being shot (17 versus 4 patients, odds ratio (OR) = 12, $p = 0.002$). Thirteen (62%) had injuries to the right ventricle only. Three patients died during follow-up: one from lung cancer and two other patients died from myocardial infarctions, one nine years later at the age of 45 and the other eight years later at the age of 55. The survivors had functional follow-up evaluations from 2-114 months (mean 66, median 67 months) and echocardiographic follow-up from 2-107 months (mean 56, median 60 months) after their injuries. Functionally, all patients were in NYHA Class 1 status, except one patient in Class II who was 54 years old and had a mild exertional limitation. The previously injured area could only be identified by ECHO in one patient who had a patch repair of a VSD. The mean ejection fraction improved over time from a mean of 55% + 6% in the immediate post-operative period to 60% + 12% after a mean follow-up of 56 months ($p = 0.2$). After surgery, 54% of patients had a mild to moderate pericardial effusion; however, the long-term follow-up studies showed that all of these had resolved. Wall motion abnormalities occurred in 23 % of patients in the immediate post-operative period and, again, all of these resolved during long-term follow-up.

Conclusions: Patients who survive penetrating cardiac injuries have an excellent long-term functional outcome with almost no subsequent cardiac morbidity related to the injury. Full physiologic recovery and normal cardiac function can be expected if the patient survives.

QUALITY OF LIFE AFTER DELAYED ABDOMINAL WALL RECONSTRUCTION FOLLOWING OPEN ABDOMEN

BL Zarzaur, MD, MPH, CP Shahan, BS, LJ Magnotti, MD, K Emmett, MD, JM DiCocco MD, MA Croce, MD, TC Fabian, MD
 University of Tennessee Health Science Center

Presenter: BL Zarzaur, MD, MPH

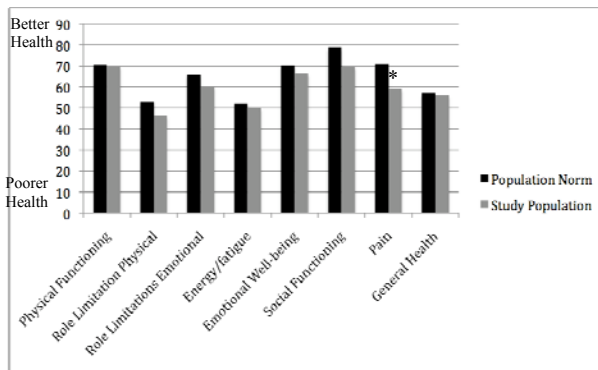
Senior Sponsor: BL Zarzaur, MD, MPH

Introduction: Large volume resuscitation following injury or intra-abdominal catastrophe results in saved lives, but, it comes with a price, the open abdomen. Delayed abdominal wall reconstruction (DAWR) using abdominal components separation, mesh or a combination of both can result in a low recurrence rate with limited morbidity and mortality. However, little is known about the quality of life (QOL) following DAWR. The purpose of this study was to determine QOL following DAWR.

Methods: Patients who had DAWR over a 15-year period were identified from the operative logs of a Level I Trauma Center. Records were reviewed for demographic, injury type and severity, and operative details. Patients were contacted via telephone or in person for QOL assessment at times ranging from 9 months to 14.6 years after repair. The QOL questionnaire contained the Rand 36-Item Health Survey 1.0 (SF-36), the Post Traumatic Stress Disorder (PTSD) Checklist-Civilian Version, and the Centers for Epidemiologic Studies Depression Scale.

Results: 152 patients were identified and 6 died prior to follow-up. Of the survivors, 41 completed the QOL questionnaire. The presenting indication for open abdomen was penetrating injury in 19 (46%), blunt injury in 18 (44%) and emergency general surgery in 4 (10%). The mean Injury Severity Score for injured patients was 25.9 ± 11.4 . Mean time to follow-up was 71.0 ± 55.6 months. Of the 31 patients working prior to DAWR, 23% had not returned to work secondary to DAWR and 19% had not returned to work for other reasons. At the time of follow-up, 65% screened positive for depression and 22.5% screened positive for PTSD. While all domains of the SF-36 were lower than population norms for the study population, only the Pain domain was significantly different ($p < 0.05$).

Conclusions: Patients who undergo staged management of the open abdomen with DAWR can achieve QOL consistent with population norms except for the pain domain. A high percentage of the patients fail to return to work secondary to the DAWR. Also, a high percentage of patients suffer from depression and PTSD, after repair. Consideration should be given to aggressive pain management and screening for depression and PTSD in this patient population to decrease the overall burden of injury for these patients.



EFFICIENCY OF INFORMATION TRANSFER DURING TRAUMA HANDOVER: A PILOT STUDY

F Habib, C Schulman, L Klein, J Graygo, C Mena, E Perdeck, J Augenstein
William Lehman Injury Research Center, University of Miami

Presenter: F Habib, MD **Senior Sponsor:** Nicholas Namias MD

Background: By its inherent organization, trauma care is delivered in shifts. At defined intervals, patient care is transferred from one group of providers to another. Accurate and complete transfer of patient information is key to successful handover. At present, the process and content of this handover remains highly variable. Efficiency of information transfer during the process remains unknown.

Methods: Patients still in the resuscitation area at the time of sign-out were included in the study. A dataset comprising the items of information deemed important for effective handover was created. Data presented at handover was collected at sign-out (sign-out group). A second datasheet was then filled by examining the medical record immediately following the sign-out (Resus group). A comparison of data presented to data available was made. Data points were scored as 0, 1, and 2 if none, partial or complete information was provided. Statistical comparisons were made using the Fischer's exact test.

Results: Thirty-five patients were included in this pilot study. A significantly lower proportion of information considered important was presented at handover than was available in all areas except demographics and pending consults (Table 1).

Table 1: Data presented (sign-out) versus data available (Resus)

Data	Sign-Out	Resus	p-value
Demographics	5.6±0.9	6.0±0	0.789
Pre-hospital	2.3±2.2	7.8±0.8	0.00001
LOC	1.2±1.1	1.9±0.3	0.0002
Initial Physiology	4.2±3.0	11.8±0.6	0.00001
Current Physiology	1.2±1.8	10.5±2.5	0.0000001
External Injuries	1.7±1.5	3.6±2.2	0.00007
Diagnostic Work-up	5.1±2.8	7.9±0.5	0.0000001
Consults	0.8±1.0	1.3±1.0	0.056
Disposition	1.4±0.9	1.9±0.3	0.002
Key issues	1.1±0.7	1.8±0.4	0.000007
Total	24.7±7.6	54.5±4.3	0.00000001

Conclusion: A significant failure to transfer important information during handover exists in trauma care. Efforts to standardize content and process as well as to develop an educational curriculum on effective handover appear warranted.

RESULTS OF THE CONTROL TRIAL: EFFICACY AND SAFETY OF RECOMBINANT ACTIVATED FACTOR VII IN THE MANAGEMENT OF REFRACTORY TRAUMATIC HEMORRHAGE

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Harvard Med Sch;Johannesburg Hosp;Univ Maryland Sch of Med;Vanderbilt Coordinating Ctr;Univ Tennessee Hlth Sci Ctr;Univ Texas Hlth Sci Ctr_Houston;Meilahti Hosp;Liverpool Hosp; Erasme Univ Hosp;Novo Nordisk;Univ of Witten/Herdecke

Presenter: Carl J. Hauser, MD

Senior Sponsor: Carl J. Hauser, MD

Background: Traumatic coagulopathy can contribute to early death by exsanguination or to late death in MOF. Recombinant Factor VIIa (rFVIIa, NovoSeven®) is a procoagulant that might limit bleeding and improve trauma outcomes.

Methods: We performed a phase 3 randomized clinical trial evaluating efficacy and safety of rFVIIa as an adjunct to direct hemostasis in major trauma. We studied 573 patients (481 blunt, 92 penetrating) who bled 4-8 RBC units within 12h of injury and were still bleeding despite strict damage control management. Patients were assigned to rFVIIa (200µg/kg initially; 100µg/kg at 1 and 3 hours) or placebo. ICU management was standardized using evidence-based trauma 'bundles' with rapid oversight of compliance. Primary outcome was 30-day mortality. Pre-defined secondary outcomes included all blood products used. Safety was assessed through 90 days. Study powering was based on prior RCTs and large trauma-center databases.

Results: Enrollment was terminated at 573/1502 planned patients following futility analysis prompted by unexpected low mortality (10.8% vs. 27.5% planned/predicted) and difficulties consenting and enrolling sicker patients. Mortality was 11.0% (rFVIIa) vs. 10.7% (placebo) (p=0.93, blunt), and 18.2% (rFVIIa) vs. 13.2% (placebo) (p=0.40, penetrating). Blunt trauma rFVIIa patients received (mean±SD) 7.8±10.6 RBC units and 19.0±27.1 total allogeneic units through 48h, placebo patients received 9.1±11.3 RBC (p=0.04) and 23.5±28.0 total units (p=0.04). Adverse events were similar.

Conclusions: rFVIIa reduced blood-product use but did not affect mortality. Modern evidence-based trauma care appears to lower mortality. Better care and impediments to timely enrollment make improved mortality difficult to demonstrate in well-controlled trauma trials.

RISK FACTORS ASSOCIATED WITH CERVICAL SPINE INJURY IN NEWER VEHICLES

Deborah M. Stein, James V. O'Connor, Joseph Kufera, Shiu Ho, Patricia C. Dischinger, Thomas M. Scalea

R Adams Cowley Shock Trauma Center and National Study Center for Trauma and EMS, University of Maryland School of Medicine

Presenter: Deborah M. Stein, M.D.

Senior Sponsor: Thomas Scalea, M.D.

Objectives: Cervical spine and spinal cord injuries (CSI) are a significant cause of morbidity and mortality following motor vehicle collisions (MVC). With an increased focus on safety in vehicle designs, it is important to elucidate which risk factors are associated with CSIs. By utilizing the Crash Injury Research Engineering Network (CIREN) database, we attempted to identify epidemiological and biomechanical characteristics associated with CSI in newer vehicles.

Methods: From 1996 to 2009, data were prospectively collected at 10 CIREN sites. Data were abstracted on all case occupants over age 14, their injuries, and biomechanical characteristics of the crash. Case occupants with CSI were compared against those without. Chi squared analysis was used to determine statistical significance for most variables.

Results: Of the 3379 case occupants in the CIREN database, 414 had a documented CSI (12%). Mortality in the group with CSI was 24% vs. 10% in occupants without CSI ($p < 0.001$). Occupant characteristics associated with CSI were increasing age ($p = 0.001$) and alcohol use ($p = 0.009$). The only biomechanical factor significantly associated with CSI was rollover collision type ($p < 0.001$), whereas seatbelt use and airbag deployment were not protective against CSI. Higher delta-v (> 45 mph) was also not found to be associated with CSI. Injury-specific factors associated with CSI were increased Injury Severity Score (ISS) ($p < 0.001$) and the presence of head ($p < 0.001$), face ($p = 0.002$) and thorax ($p < 0.001$) injuries. Abdominal injuries and upper and lower extremity fractures were not associated with CSI.

Conclusions: Even with newer vehicles with improved safety features, CSI remains common and results in significant mortality. Certain occupant and crash characteristics, such as age and rollover type impact, are strongly associated with CSI. Surprisingly, higher severity crashes are not associated with an increased risk of CSI. Current safety measures, such as seat belts and airbags, are not protective against these injuries. Prevention of CSI in motor vehicle crashes should focus on improving safety in rollover crashes and designing restraint systems that provide more protection to the cervical spine.

MANAGEMENT OF PULMONARY EMBOLISM WITH RHEOLYTIC THROMBECTOMY

L.Ferrigno, R.Bloch, J.Threlkeld, T.Demlow, R.Kansal, R. Karmy-Jones
Southwest Washington Medical Center

Presenter: Lisa Ferrigno MD.

Senior Sponsor: Riyad Karmy-Jones MD

Introduction: The Angiojet® (Possis Medical, Minneapolis, MN) catheter performs rheolytic thrombectomy, a combination of fragmentation and suction, that, can permit rapid clot lysis. Lytic agents can be added using pulse spray in minimal doses.

Methods: A retrospective review of patients who underwent Angiojet pulmonary embolectomy with pulse spray technique was performed. Patients were classified by American College of Chest Physicians criteria as having clinical massive or submassive pulmonary embolism (PE), and mild or severe right ventricular dysfunction (RVD). Data collected included pre- and post procedure systolic blood pressure, heart rate, shock index (HR/SBP), mean pulmonary artery pressure (PAP), Miller score and New York Heart Association (NYHA) score.

Results: In the past 18 months, 16 patients (54.4 ± 15.8 years of age) underwent embolectomy. Each patient had pulmonary artery tPA instilled using pulse spray through the angiojet. Six had undergone surgery within 30 days. Five of the 16 patients had clinical massive PE (2 in cardiogenic shock) and 3/11 submassive cases had severe RVD. Eleven patients underwent catheterization within hours of diagnosis of PE while the remaining 5 had an initial course of anticoagulation before proceeding to catheterization because of clinical deterioration. Five patients had 12-24 hours of tPA infusion following thrombectomy because of more chronic or extensive peripheral thrombus. Improvement in hemodynamic function and Miller score were noted in both, although more marked in the massive PE group.

	HR-pre (bpm)	HR-post (bpm)	SBP-pre (mmHg)	SBP-post (mmHG)	Time to cath (HRS)
Submassive	110+15	87+21	145+27	138+27	21+26
Massive	128+43#	103+31*	88+8#	116+22*	8+10#
	SI-pre	SI-post	Miller-pre	Miller-post	Saddle emboli
Submassive	0.78+0.1	0.56+0.2*	17+1.4	8.8+3*	3
Massive	1.6+0.6	0.9+0.2*	21+3.2	13+2*	5
	PAP-pre (mmHg)	PAP-post (mmHg)	ICU-los (days)	LOS (days)	NYHA at follow up
Submassive	39+5	34+4	1.5+0.8	4+2.6	1.5+0.8
Massive	41+8	32+6	9.6+12#	13.8+15#	1.78+0.9

= $p < 0.05$ between groups * = $p < 0.05$ within groups

In the massive PE group one patient died and 3 survivors experienced complications including retroperitoneal bleed (two) and renal failure which resolved (two). At follow up (6 ± 5 months) 2 patients in the massive PE group had evidence of mild cor pulmonale.

Conclusions: Rheolytic thrombectomy is an effective management strategy in managing massive pulmonary embolism. Whether or not it should be used in favor of systemic lytic therapy in patients with submassive PE, is not clear, but deserves a comparative study.

QUANTIFYING HYPERCOAGULABLE STATE AFTER BLUNT TRAUMA: MICRO-VESSICLES AND RATE OF THROMBIN GENERATION ARE INCREASED, WHILE STANDARD MARKERS ARE NOT

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Mayo Clinic, Rochester MN

Presenter: Myung S. Park, MD

Senior Sponsor: Henry J. Schiller, MD

Objective: Major trauma is an independent risk factor for developing venous thromboembolism (VTE), a complication of the hypercoagulable state post-injury. While increase in thrombin generation and circulating microvesicles (MVs), has been associated with VTE in non-trauma patients, this association has yet to be documented in trauma patients. This pilot study was performed to characterize and quantify thrombin generation and plasma MVs in individuals after traumatic injury.

Methods: Blood samples were collected in the trauma bay from 52 blunt injured patients and processed to plasma for 1) isolation of MVs, which were quantified by flow cytometry; 2) assessing native thrombin generation kinetics by Calibrated Automatic Thrombogram (CAT) assay, i.e. Lag time (LT) and Peak Height (PH). Clinical data were collected prospectively and expressed as mean \pm standard deviation. Twenty nine controls were enrolled.

Results: Among 39 men and 13 women (age = 40 ± 17) the injury severity score (ISS) was 13 ± 11 , Hgb 13.9 ± 1.8 , INR 1.0 ± 0.1 , PTT 25 ± 3 (sec) and platelets 238 ± 62 .

Table 1	Patients	Control	P value
Total # MV / μ L	$954 \pm 2158^*$	197 ± 123	< 0.05
LT (min)	$28 \pm 16^*$	45 ± 22	< 0.01
PH (nM)	$76 \pm 65^*$	32 ± 35	< 0.05

PH correlated with ISS (Pearson correlation coefficient = 0.5 [$p = 0.002$]).

Conclusion: Patients with blunt trauma have significantly higher number of circulating MVs and more rapid thrombin generation than in healthy controls while clinically available standard coagulation tests were within normal range. Future studies will assess the role of MVs and thrombin generation kinetics in risk-stratification of VTE to guide chemoprophylaxis after trauma.

DO WE KNOW IT WHEN WE SEE IT? THE DEFINITION AND IMPACT OF ACUTE KIDNEY INJURY AFTER TRAUMA

M, Cohen E, Johnson M, Call P, Rahn JF, Pittet K, Liu
University of California San Francisco

Presenter: Mitchell Jay Cohen MD

Senior Sponsor: Mitchell Jay Cohen MD

Background: Acute kidney injury (AKI) is associated with increased morbidity and mortality in hospitalized patients. Recent consensus definitions for AKI have focused on change in serum creatinine (SCr) from “baseline” renal function, but there is considerable controversy about how to define baseline. Therefore the ideal definition of AKI and implications on the incidence and outcome of AKI after trauma is unknown. The purpose of this study was to examine the ideal definition of AKI for the trauma patient.

Methods. We examined 205 severely injured patients who were admitted to an urban level I trauma center after major trauma over an 18 month period. We compared the incidence of AKI (defined as a doubling of SCr from baseline), using 3 different definitions of baseline SCr. Baseline was defined as: (1) admission SCr (2) lowest SCr on hospital days 1 and 2, as has been done in prior studies and (3) a calculated SCr corresponding to an estimated glomerular filtration rate (eGFR) of 75 mL/min, as has been proposed in consensus guidelines. We then tested the association of AKI with cystatin C, a more sensitive marker of kidney function than SCr. Plasma cystatin C was measured using a Behring-Dade nephelometer from plasma samples obtained at the time of trauma activation in the Emergency Department.

Results: The incidence of AKI varied significantly depending on the definition of baseline Cr (Table).

Definition of “Baseline” SCr	Incidence n(%)
Admission Cr	6 (3%)
Lowest Cr on days 1 and 2 of hospitalization	12 (5.8%)
Calculated Cr corresponding to eGFR of 75 ml/min	11 (5.4%)

However, while all 3 definitions were associated with poor patient outcomes (death, duration of ICU stay and time on the ventilator), only AKI defined as a change in SCr from admission SCr was associated with a difference in serum cystatin C levels. Using this definition for AKI, serum cystatin C at admission was 0.87 mg/dL, compared to 0.6 mg/dL in those without AKI, ($p = 0.04$).

Conclusions: The incidence of AKI varies based on the definition of “baseline” SCr used, confounding attempts to define this outcome after trauma. Correlation with another robust marker of renal function, cystatin C, indicates that the best and most robust pathophysiologic definition uses SCr at admission. These data show that a definition based on baseline of admission SCr should be used to define and diagnose AKI after trauma and can thereby provide a single definition for AKI after trauma.

COST-DRIVEN INJURY PREVENTION: CREATING AN INNOVATIVE PLAN TO SAVE LIVES WITH LIMITED RESOURCES

RA Dicker, MD; D Lopez, MPH, RN; MM Knudson, MD; I Crane; W Max, PhD
University of California, San Francisco

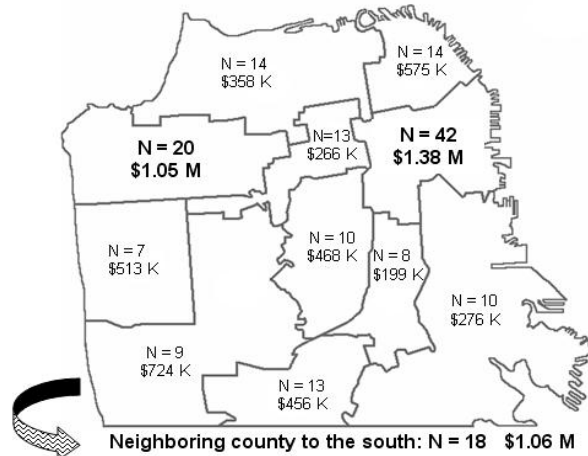
Presenter: Rochelle A Dicker **Senior Sponsor:** Rochelle A Dicker

Background: Pedestrian injury costs over \$20 billion annually. Countermeasures such as blinking crosswalks can be expensive but expectedly vital to injury prevention efforts. We aimed to create a new framework of cost-driven surveillance. The purpose of our study was to carry out a detailed analysis of the hospital cost and its relationship to location of pedestrian injury. Targeting identified “high cost areas” with effective countermeasures could save lives *and* be most cost effective. Our hypothesis is that pedestrian injury creates a tremendous public funding burden and that hotspot sites can be mapped based on corresponding hospital costs.

Methods: We conducted a retrospective analysis of billing records of 694 auto-versus-pedestrian victims treated at our city’s Level I Trauma Center in the sample year 2004. Total cost was computed using cost to charge ratios for hospital and ambulance fees and actual cost of professional fees. City District “price tags” were assigned per detailed patient cost data to corresponding spatial analysis of intersections. Chi-Square analyses were conducted on demographic variables. Multiple regression analysis determined predictors of total cost.

Results: The total cost of injury was \$9.8 million, while the total charge was \$20.8 million. 90% of victims resided in our city. 31% were admitted and cost of their care accounted for 76% of the total. Admitted patients were older than nonadmitted patients (47 vs. 38 years; $t = 5.45, p = 0.00$). Spatial analysis determined that of 11 City Districts, three districts accounted for almost 50% of the total cost (Figure). 76% of the total cost was publicly funded. The strongest predictors of cost were length of stay ($\beta = .77, t(220) = 30.42, p = .000$) and ventilator days ($\beta = .51, t(220) = 6.69, p = .000$).

Figure. Number of Auto vs. Pedestrian incidents and their associated medical costs by city supervisory district, 2004.



Conclusions: These findings provide a roadmap to target costly hot spots for city planning of preventive countermeasures. In a climate of limited resources, this kind of roadmap outlines the three regions that could most benefit from countermeasures from both an injury prevention and cost containment standpoint. Cost-driven surveillance is useful in city strategic planning of cost effective and life-saving pedestrian injury prevention.

ABDOMINAL AORTIC RUPTURE FROM BLUNT TRAUMA: A CASE OF AN IMPAILING OSTEOPHYTE

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The University of Kansas School of Medicine - Wichita and Via Christi Regional Medical Center

Presenter: Seth A. Vernon, M.D.

Senior Sponsor: James M. Haan, M.D.

Introduction: Aortic injuries after blunt trauma carry a high mortality and generally involve the thoracic aorta. Abdominal aortic injuries after blunt trauma are uncommon. We present the first case of an abdominal aortic rupture resulting from an osteophytic spur piercing the aorta after a thoracolumbar spine fracture-dislocation.

Case Presentation: A 77-year-old male driver reversed vehicle into a tree, breaking the driver chair backrest, resulting in hyperextension of his thoracolumbar spine. He was initially evaluated at an outlying facility where he was noted to be hypotensive and complained of severe lower back pain. He was transferred to our level I trauma center and arrived 3 hours post-injury. Upon evaluation in our facility his vitals were normal, GCS 15, and his physical examination was unremarkable. Medical history was significant for diabetes mellitus, hypertension, coronary artery disease, congestive heart failure, peripheral neuropathy, and degenerative joint disease. Notably the patient was taking aspirin and clopidogrel. Surgical history was negative for abdominal or thoracic surgeries. He complained of severe back pain that he attributed to the long spine board. CTA of his chest, abdomen, and pelvis revealed the following: T12 –L1 fracture-dislocation with a degenerative osteophyte piercing the aorta, retroperitoneal contrast extravasation at the aortic laceration, paravertebral hematoma, T12-L1 spinous process fractures, and L1 right transverse process fracture. The aortic injury was 3 mm inferior to the origin of the celiac artery.

The patient underwent emergent endovascular stent graft repair of the pseudoaneurysm with exclusion of celiac flow. Intra-operative post-deployment angiography revealed collateral flow through the pancreaticoduodenal arcade, gastroduodenal, and hepatic artery. We elected not to perform open debranching with iliac to celiac bypass. On post-operative day one the patient underwent instrumentation and spinal stabilization. He was extubated on post-operative day three and was walking with physical therapy on post-operative day four.

Discussion: Blunt abdominal aortic injuries are rare. We present both an unusual mechanism of injury and innovative surgical therapy. Our case supports the feasibility of using endovascular techniques for proximal abdominal aortic injuries with exclusion of the celiac trunk, adding to the mounting evidence that endovascular repair of traumatic aortic injuries is reasonable in select trauma patients. Furthermore, this is the first documented case of a T12 osteophyte spearing the abdominal aorta, and the first example of an endovascular approach to an aortic injury at this unique location with a good outcome.

SURVIVAL FOLLOWING BLUNT CARDIAC RUPTURE FROM A 45 FOOT FALL

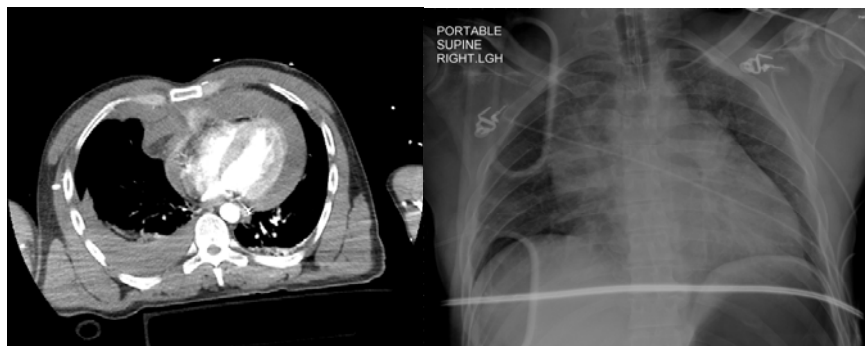
R.J. Leone, MD, PhD, J.M. Douglas, Jr, MD
St. Joseph Hospital

Presenter: Richard J. Leone, MD, PhD

Senior Sponsor: Richard J. Leone, MD, PhD

Cardiac rupture following blunt trauma is typically fatal. We present a case of survival of a patient with blunt cardiac rupture.

A 43 year old construction worker suffered an unrestrained 45 foot fall from the roof of a building, landing in mud. He suffered chest trauma and multiple orthopedic injuries. The patient was initially awake enroute to the ED. Following arrival the patient suffered cardiac and respiratory arrest requiring intubation. Initial CXR and CT demonstrated hemopericardium. An emergent sternotomy was performed and a right ventricular free wall perforation with adjacent rib fracture was identified. This was repaired in the ED and the patient was taken to the OR for mediastinal washout and closure. He regained hemodynamic stability and was transferred to ICU. After continued chest tube bleeding he was returned to the OR for exploration, and experienced ventricular fibrillation x3. This responded well to defibrillation and electrolyte repletion, and the sternotomy was closed. The patient subsequently underwent orthopedic repair of an L3 burst fracture and multiple long bone fractures. He was advanced to a regular diet, was ambulating with assistance, and was discharged neurologically intact to a rehabilitation facility on postoperative day # 11. This represents an unusual survival to surgery of a typically fatal blunt cardiac injury.



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 multicenter 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 contendor 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.

