Trauma Systems

FEATURE

Improved Functional Outcomes for Major Trauma Patients in a Regionalized, Inclusive Trauma System

Belinda J. Gabbe, BPhysio (Hons), Grad Dip Biostat, MAppSc, PhD, Pam M. Simpson, BSc (Hons),* Ann M. Sutherland, RN, RM, Grad Dip, Occ Environ Health,*† Rory Wolfe, BSc, PhD,* Mark C. Fitzgerald, MBBS, FACEM, MRACMA,‡§ Rodney Judson, MBBS, FRACS, FRCS, FACS,|| and Peter A. Cameron, MBBS, MD, FACEM*†*

- *Ann Surg 2012;255:1009–1015)*

Trauma Systems

- 12-month functional (Glasgow Outcome Scale - Extended) outcomes after blunt major trauma (ISS>*15)* Victoria State Trauma System - ordered logistic regression analysis.

- October 2006 to June 2009, 12 month follow-up

- *Ann Surg 2012;255:1009–1015)*

Trauma Systems

- Annual decline in mortality & an observed increase in risk-adjusted functional outcomes improved over time
- Cases managed at MTS (level-1 trauma centers) demonstrated better functional outcomes.
- *Ann Surg 2012;255:1009–1015)*

Assessment

Research

Original Investigation

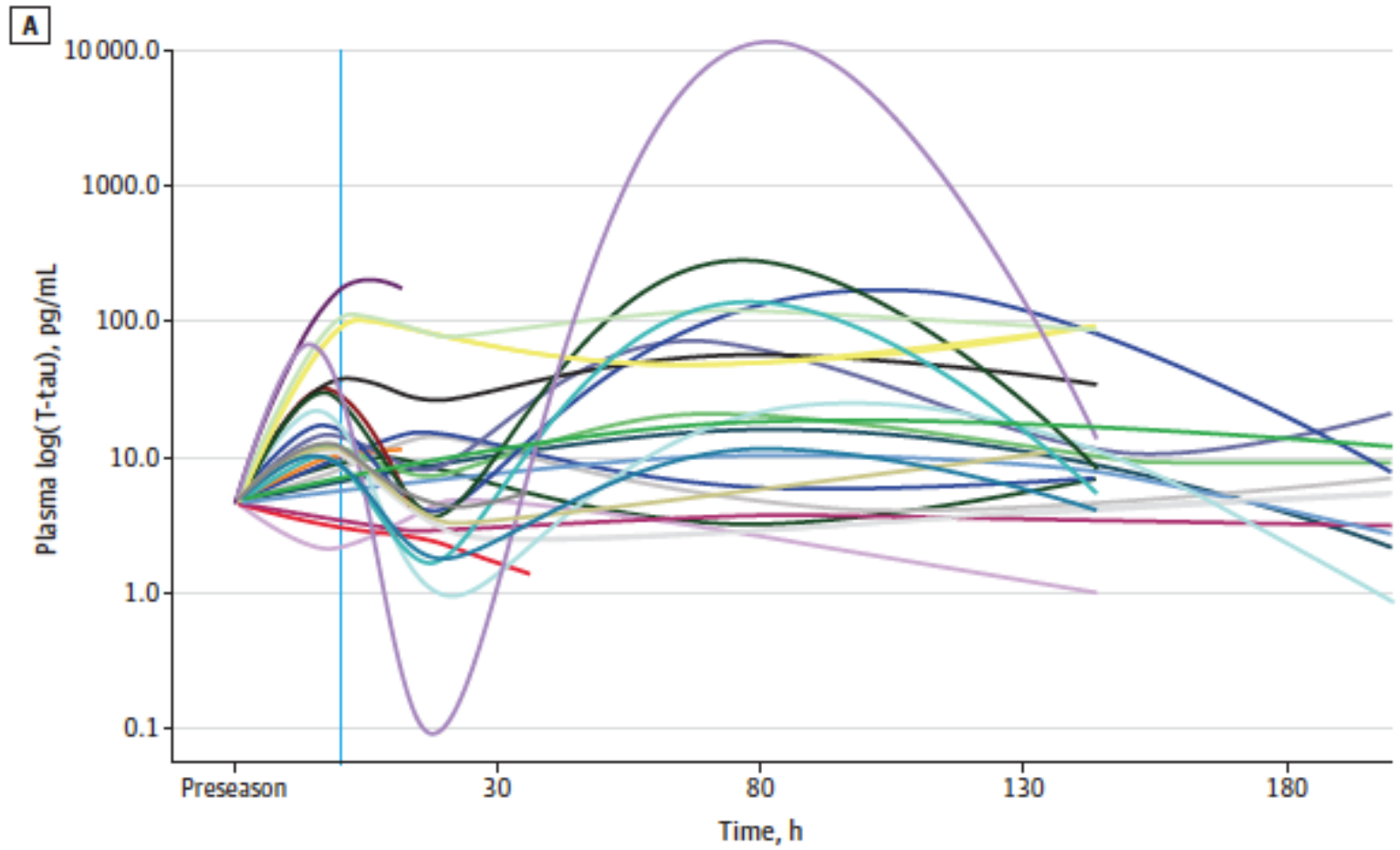
Blood Biomarkers for Brain Injury in Concussed Professional Ice Hockey Players

Pashtun Shahim, MD; Yelverton Tegner, MD, PhD; David H. Wilson, PhD; Jeffrey Randall, PhD; Tobias Skillbäck, MD; David Pazooki, MD, PhD; Birgitta Kallberg, BSc; Kaj Blennow, MD, PhD; Henrik Zetterberg, MD, PhD

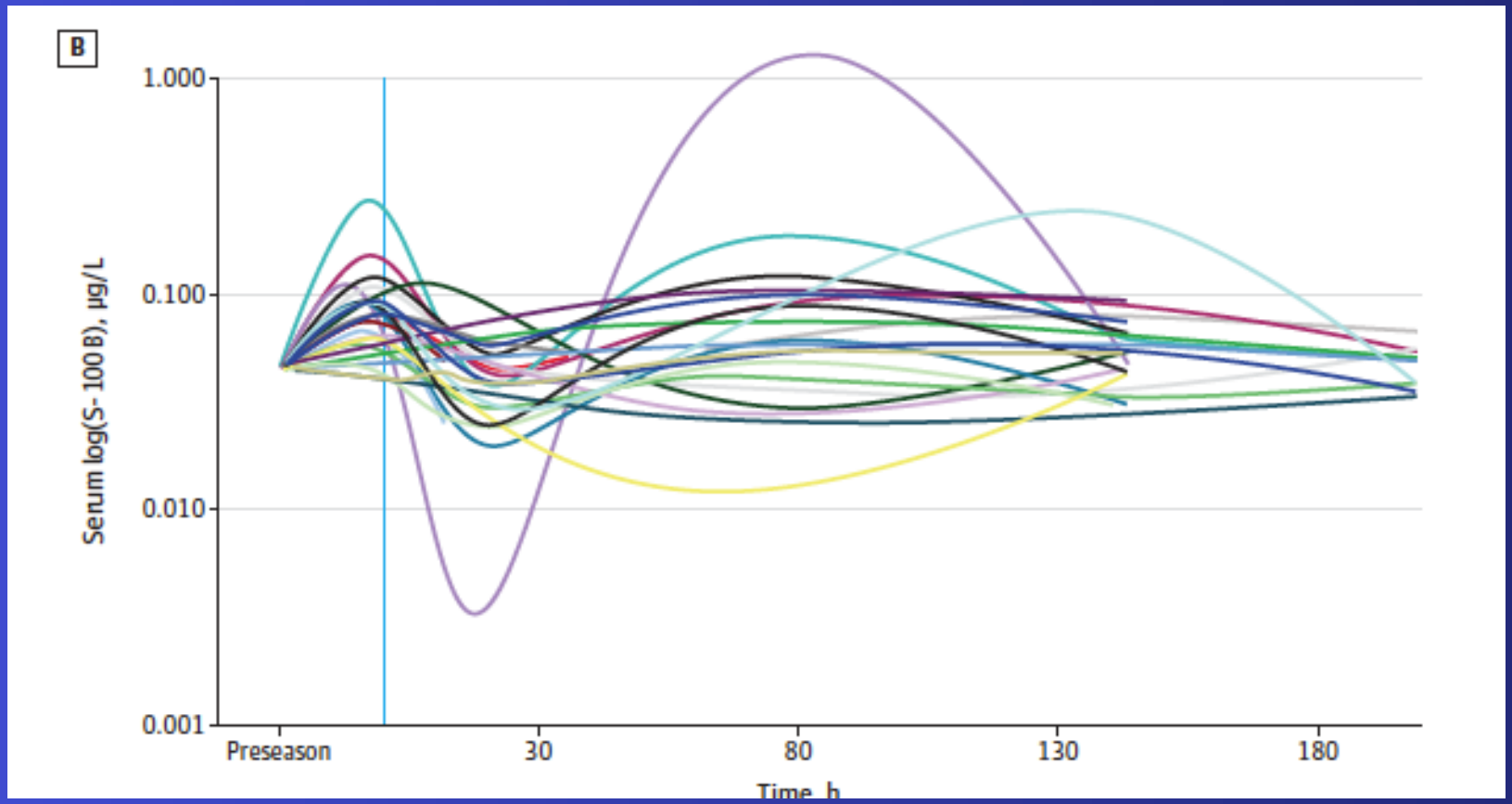
- *JAMA Neurol*. doi:10.1001/jamaneurol.2014.367

  Published online March 13, 2014.

Assessment


A
10 000.0
1000.0
100.0
10.0
1.0
0.1
Plasma log(T-tau), pg/mL
Preseason
30
80
130
180
Time, h

Assessment


B
1.000
0.100
0.010
0.001
Serum log(S-100B), µg/L
Preseason
30
80
130
180
Time, h

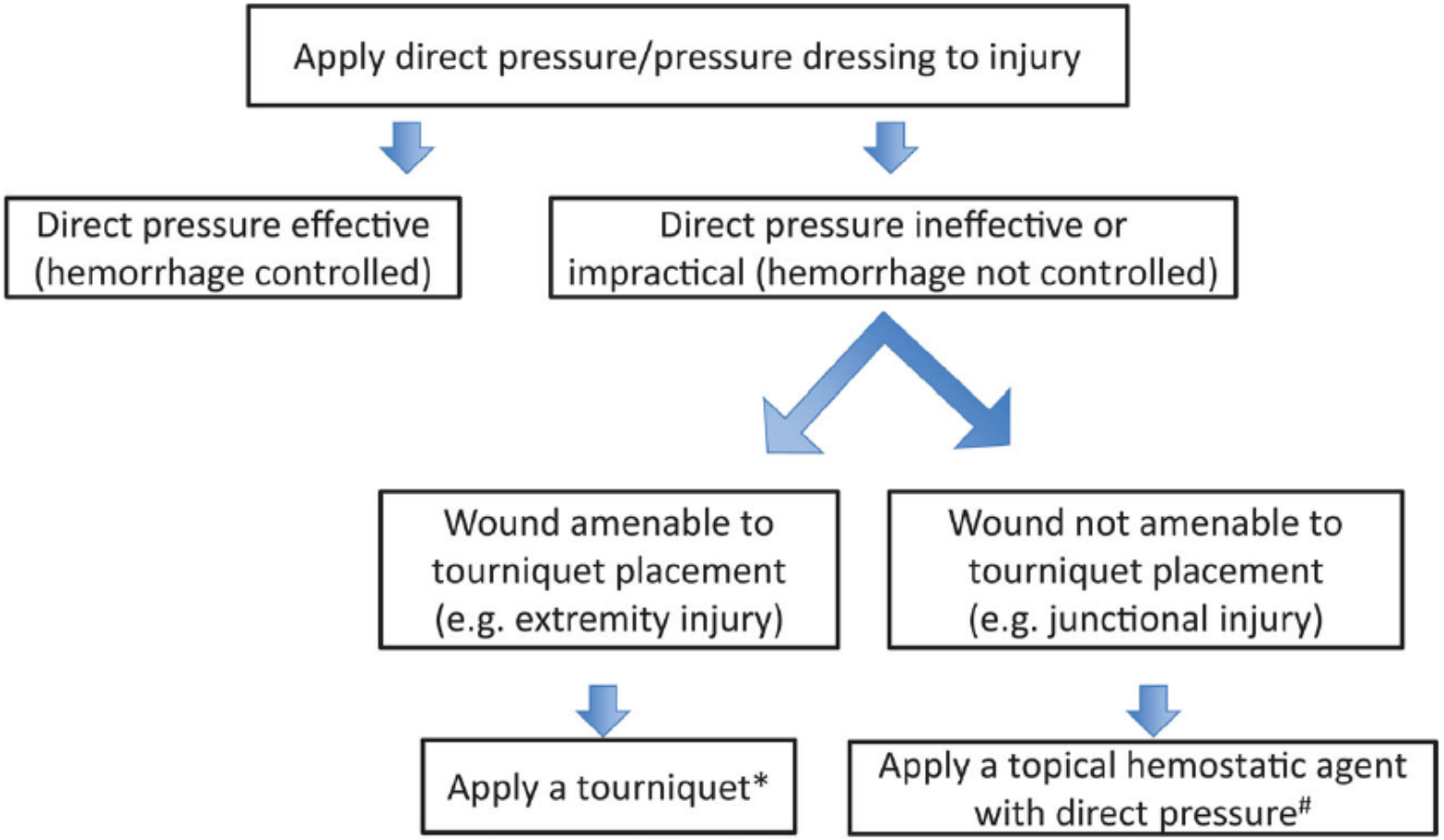
SPECIAL CONTRIBUTION

AN EVIDENCE-BASED PREHOSPITAL GUIDELINE FOR EXTERNAL HEMORRHAGE CONTROL: AMERICAN COLLEGE OF SURGEONS COMMITTEE ON TRAUMA

Eileen M. Bulger, MD, FACS, David Snyder, PhD, Karen Schoelles, MD, FACP, Cathy Gotschall, ScD, Drew Dawson, BA, Eddy Lang, MD, CM CCFP (EM) CSPQ, Nels D. Sanddal, PhD, NREMT, Frank K. Butler, MD, FAAO, FUHM, Mary Fallat, MD, FACS, Peter Taillac, MD, Lynn White, MS, CCRP, Jeffrey P. Salomone, MD, FACS, NREMT-P, William Seifarth, MS, NREMT-P, Michael J. Betzner, MD, FRCPC, Jay Johannigman, MD, FACS, Norman McSwain, Jr., MD, FACS, NREMT-P

PREHOSPITAL EMERGENCY CARE 2014;18:163–173

Prehospital External Hemorrhage Control Protocol



GUIDELINES

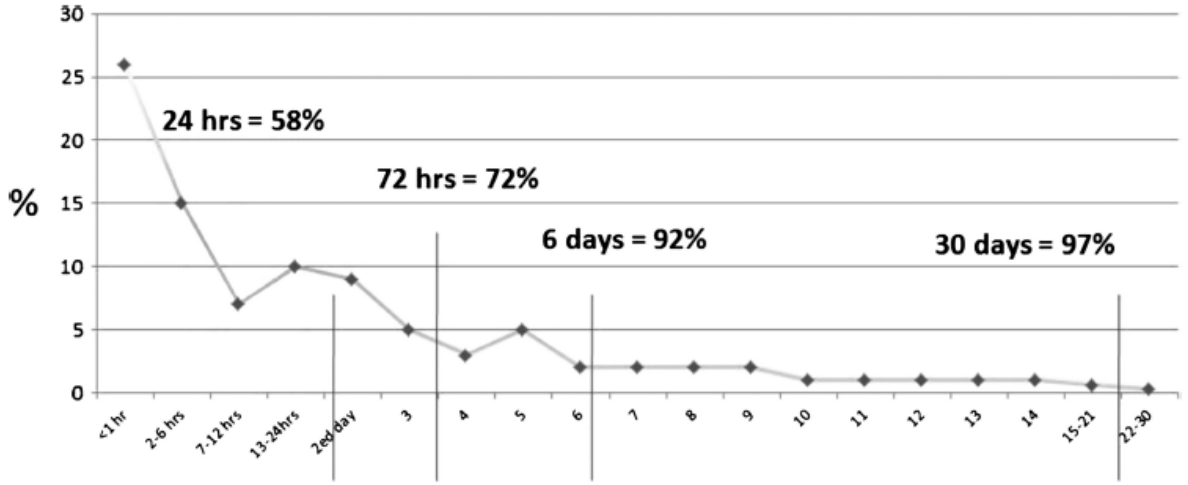
Current opinion on catheter-based hemorrhage control in trauma patients

- John B. Holcomb, MD, Erin E. Fox, PhD, Thomas M. Scalea, MD, Lena M. Napolitano, MD, Rondel Albarado, MD, Brijesh Gill, MD, Brian J. Dunkin, MD, Andrew W. Kirkpatrick, MD, Bryan A. Cotton, MD, Kenji Inaba, MD, Joseph J. DuBose, MD, Alan M. Cohen, MD, Ali Azizzadeh, MD, Megan Brenner, MD, Mitchell J. Cohen, MD, Charles E. Wade, PhD, Alan B. Lumsden, MD, Richard Andrassy, MD, Peter M. Rhee, MD, MPH, Barbara L. Bass, MD, Kenneth L. Mattox, MD, L.D. Britt, MD, A. Brent Eastman, MD, David B. Hoyt, MD, Todd E. Rasmussen, MD, and the Catheter-Based Hemorrhage Control Study Group, Houston, Texas

- J Trauma Acute Care Surg Volume 76, Number 3, Mar 2014

Catheter Based Hemorrhage

J Trauma Acute Care Surg
Volume 76, Number 3



Trauma admissions = 36,028
Overall deaths = 2394
Overall mortality = 6.6%
Deaths from day 31-171 = 68/2394 = 3%

Figure 1. Memorial Hermann Hospital trauma admission mortality, 1999–2008.

Catheter Based Hemorrhage

- Trauma hybrid operating room (THOR) concept
- Resuscitative endovascular balloon occlusion of the aorta (REBOA)
- Endovascular Skills for Trauma and Resuscitative Surgery(ESTARS)
- Basic Endovascular Skills for Trauma (B.E.S.T.)

Catheter Based Hemorrhage

- RAPTOR (resuscitation with angiography, percutaneous techniques and operative repair) suites, have recently been installed in Calgary, Canada, and Sydney, Australia, as well as the Karolinska Institute in Sweden

Resuscitation

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Hydroxyethyl Starch or Saline for Fluid Resuscitation in Intensive Care

Myburgh JA et al NEJM 367;20 November 15, 2012

Resuscitation

- RCT 7000 patients ICU admit
- 6% HES - molecular weight of 130 kD and a molar substitution ratio of 0.4 (130/0.4, Voluven) in 0.9% sodium chloride vs NS
- All fluid resuscitation until ICU discharge, death, or 90 days

Myburgh JA et al NEJM 367;20 November 15, 2012

Resuscitation

- Primary outcome was death within 90 days.
- Secondary outcomes included acute kidney injury and failure and treatment with renal-replacement therapy.

Myburgh JA et al NEJM 367;20 November 15, 2012

Resuscitation

- Renal-replacement therapy - 235 of 3352 patients
- (7.0%) in the HES group
- (5.8%) in the saline group
  - (relative risk,1.21; 95% CI, 1.00 to 1.45; P = 0.04)

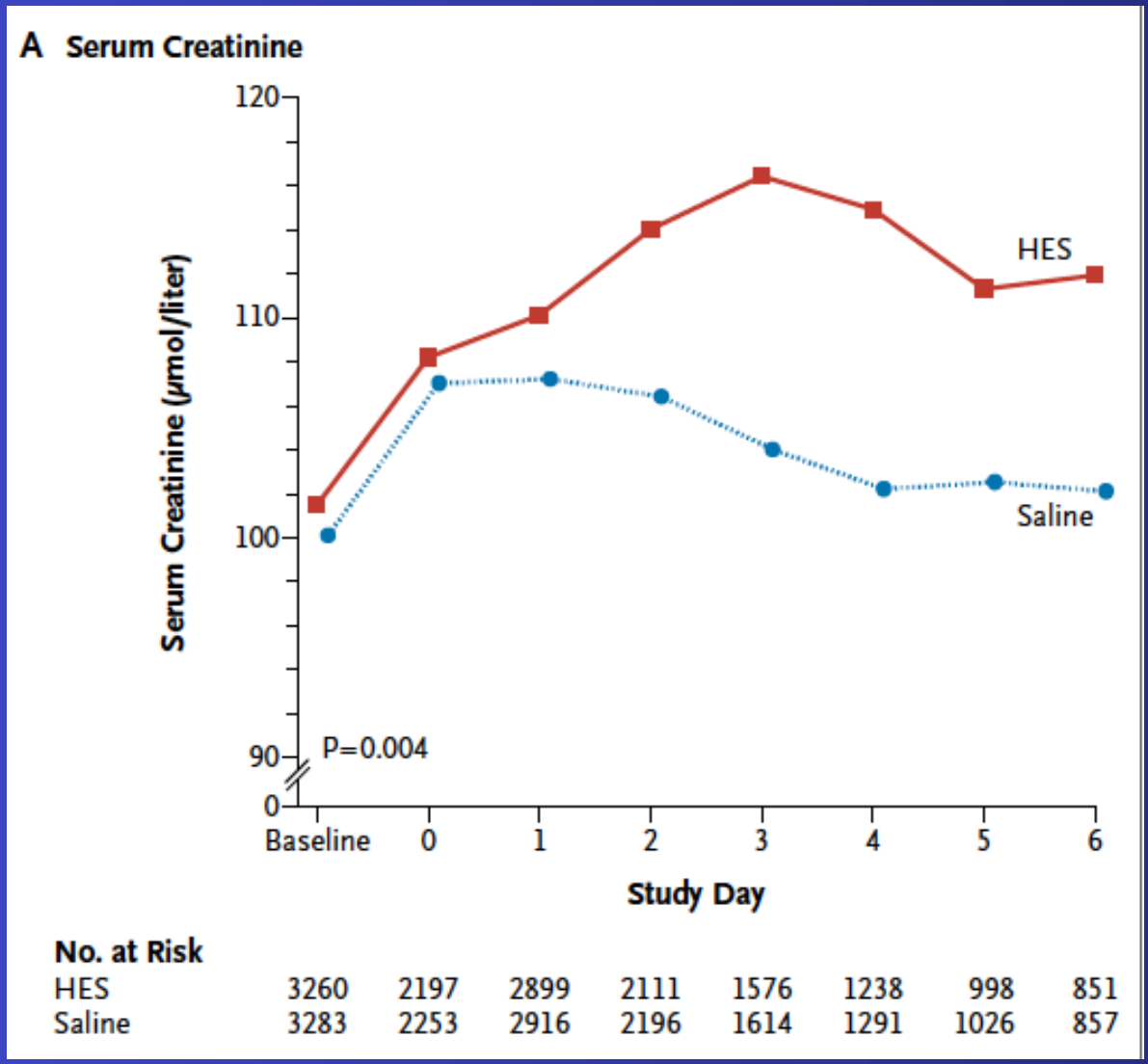
Myburgh JA et al NEJM 367;20 November 15, 2012

Resuscitation

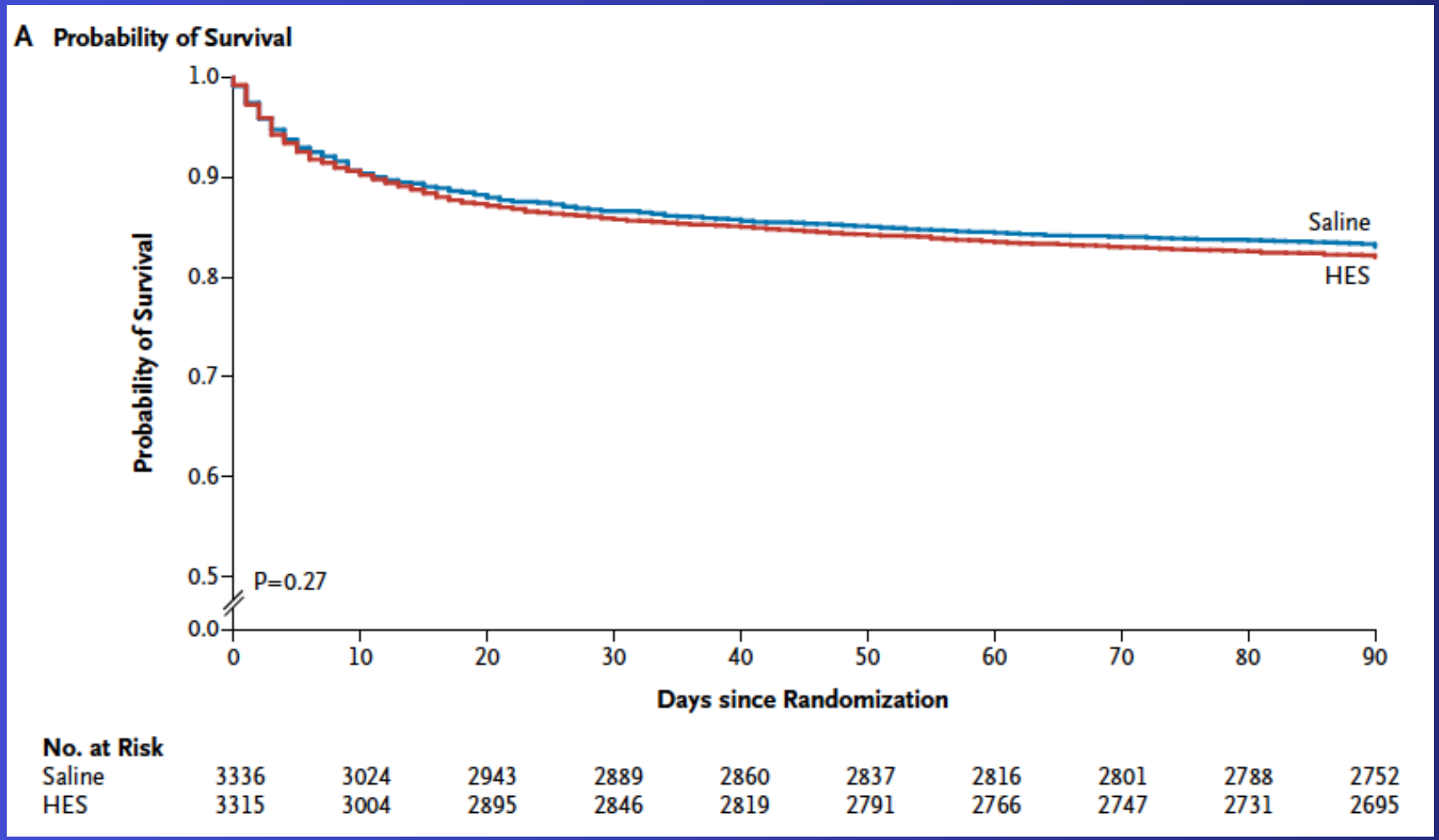
- Renal failure occurred in 10.4% and 9.2% of patients, respectively (P = 0.12)

- HES significantly more adverse events (5.3% vs. 2.8%, P<0.001).

Myburgh JA et al NEJM 367;20 November 15, 2012



Myburgh JA et al NEJM 367;20 November 15, 2012



Myburgh JA et al NEJM 367;20 November 15, 2012

Resuscitation

CARING FOR THE
CRITICALLY ILL PATIENT

Association of Hydroxyethyl Starch Administration With Mortality and Acute Kidney Injury in Critically Ill Patients Requiring Volume Resuscitation

A Systematic Review and Meta-analysis

Ryan Zarychanski, MD, MSc et al *JAMA. 2013;309(7):678-688*

Resuscitation

- Hydroxyethyl starch administration was significantly associated with increased mortality and severe kidney injury (acute renal failure and renal replacement therapy).

Ryan Zarychanski, MD, MSc et al *JAMA. 2013;309(7):678-688*

Resuscitation

Resuscitation 83 (2012) 40–45

Contents lists available at SciVerse ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

Clinical paper

Comparison of intraosseous versus central venous vascular access in adults under resuscitation in the emergency department with inaccessible peripheral veins☆

Bernd A. Leidel[a,c,*], Chlodwig Kirchhoff[b], Viktoria Bogner[b], Volker Braunstein[b], Peter Biberthaler[b], Karl-Georg Kanz[b]

[a] Department of Emergency Medicine, Campus Benjamin Franklin, Charité – University Medical Centre, Berlin, Germany
[b] Department of Trauma, Medical Centre of the University of Munich, Germany
[c] Helicopter Emergency Medical Service Christoph 31, ADAC-Luftrettung Air Rescue Services, Campus Benjamin Franklin, Charité – University Medical Centre, Berlin, Germany

- Leidel et al Resuscitation 83 (2012) 40– 45

Resuscitation

- Single trauma center - Consecutive severely injured or critically ill adult presenting to emergency department without at least one 18-gauge peripheral IV access. 2 years.

- Each patient received both, IO access and CVC to compare success rate on first attempt and necessary procedure time.

- Leidel et al Resuscitation 83 (2012) 40– 45

Resuscitation

Table 1
Baseline characteristics.

	Overall ($n = 40$)
Gender male (%)	27/40 (68)
Mean age ± SD, years	48 ± 21
Min–max, years	18–87
Obesity, BMI > 30 kg/m^2 (%)	7/40 (18)
Trauma (%)	29/40 (73)
IO access insertion site humeral (%)	22/40 (55)
CVC insertion site subclavian vein (%)	33/40 (83)

BMI: body mass index, IO: intraosseous, CVC: central venous catheterisation.

- Leidel et al Resuscitation 83 (2012) 40– 45

Resuscitation

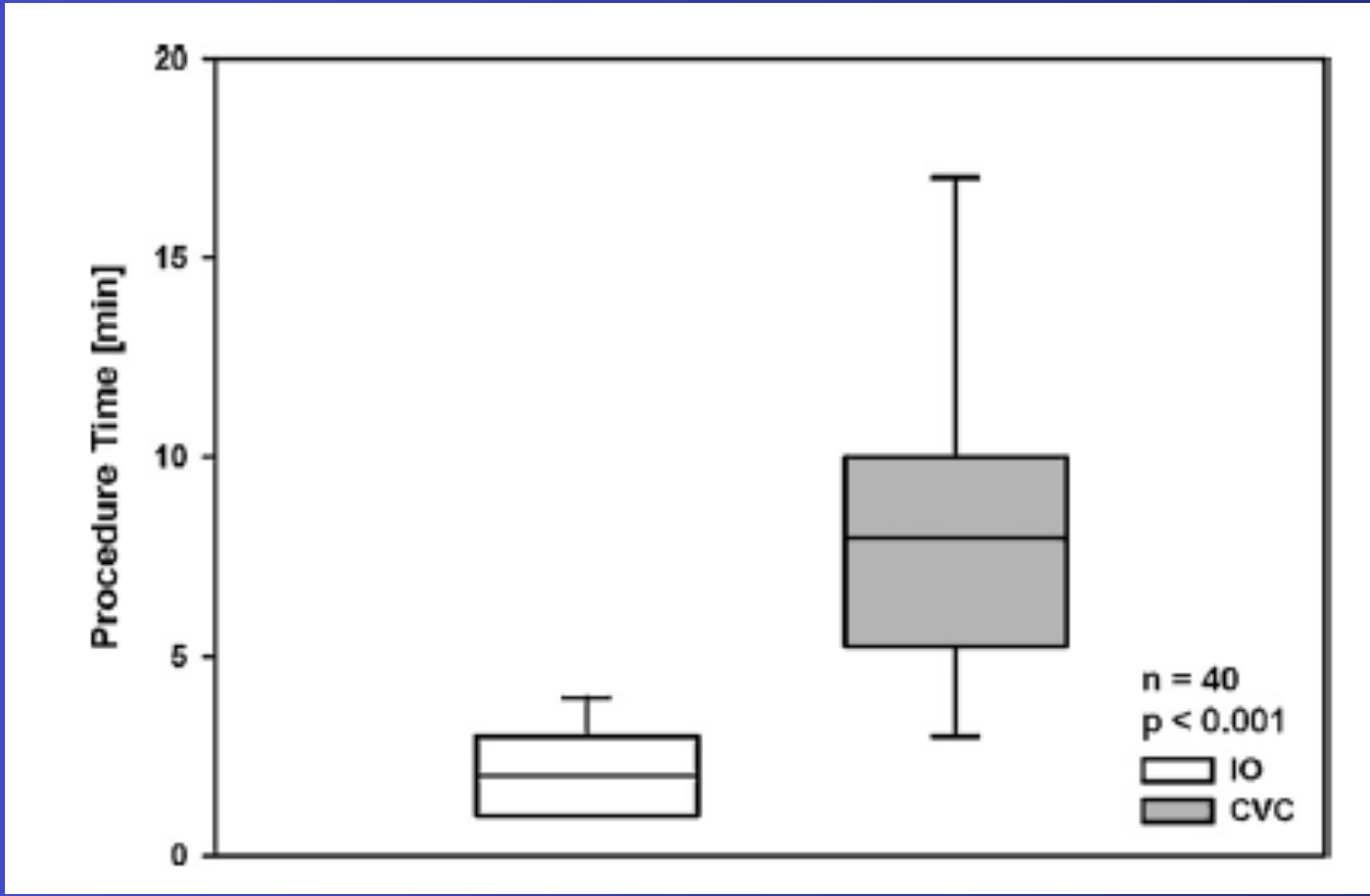
Table 2
Success rate and procedure time.

	IO ($n=40$)	CVC ($n=40$)	p
Success rate on first attempt (%)	34/40 (85)	24/40 (60)	0.024
95% CI, percentage	74–96	45–75	
Procedure time median, min	2.0	8.0	<0.001
Procedure time $Q_{0.25}$–$Q_{0.75}$, min	1.0–3.0	5.5–10.0	
Procedure time IQR, min	2.0	4.5	
Procedure time, min–max, min	1.0–4.0	3.0–17.0	
95% CI, min	1.0–3.0	4.0–13.0	

IO: intraosseous, CVC: central venous catheterisation; $Q_{0.25}$: lower quartile, 25%, $Q_{0.75}$: upper quartile, 75%, IQR: inter quartile range.

- Leidel et al Resuscitation 83 (2012) 40– 45

Resuscitation



- Leidel et al Resuscitation 83 (2012) 40– 45

Resuscitation

- IO failure in 6, no other complications documented.

Table 3
Studies of in-hospital IO vascular access in adults.

Study	*n*	Outcome	Comments
Cooper et al.[18]	22	Success 97%	No complications
Iserson[19]	22	Time <1 min	No complications
Iwama and Katsumi[20]	31	Success 94% Time <1 min	No complications, IO flow rates similar to CVC
Ong et al.[16,17]	24	Success 97% Time ≤ 20 s	No complications
Paxton et al.[5]	30	Success 81%Time, 1.5 min	11 secondary dislodgments of IO within on average 6.9 h after placement, no further complications
Valdes[21]	15	Success 87%	No complications with an average use of 5.4 days

IO: intraosseous, CVC: central venous catheterisation; *n*: number of patients; Success: success rate; Time: application time, min: Minute; s: seconds.

- Leidel et al Resuscitation 83 (2012) 40– 45

Resuscitation

CURRENT OPINION

What is the evidence of utility for intraosseous blood transfusion in damage-control resuscitation?

Melvyn Harris, MD, Robert Balog, MS, PhD, *and* Gavin Devries, MS

- Harris et al, J Trauma Acute Care Surg, 75, No.5 Nov 2013

Resuscitation

- Direct scientific and/or clinical data to support the use of IO access for the purpose of blood transfusion in adult humans - limited to anecdotal reports.

- “Based on clinical observation, the lack of clinical evidence in the medical literature, and the factors discussed herein, we postulate that maximum flow rates attainable for transfusion of blood products used in DCR via the IO route are simply inadequate for successful resuscitation.”

- Harris et al, J Trauma Acute Care Surg, 75, 5

Resuscitation

ORIGINAL ARTICLE

ONLINE FIRST

The Prospective, Observational, Multicenter, Major Trauma Transfusion (PROMMTT) Study

Comparative Effectiveness of a Time-Varying Treatment With Competing Risks

- *Holcomb JB et al Arch Surg. October 15, 2012.*

Resuscitation

- Prospective cohort study, 10 level 1 trauma centers.
- Timing of transfusion vs outcomes.

- *Holcomb JB et al Arch Surg. October 15, 2012.*

Resuscitation

- Received at least 1 unit of RBCs within 6 hours of admission (n=1245) and at least 3 total units (of RBCs, plasma, or platelets) within 24 hours (n=905)

- *Holcomb JB et al Arch Surg. October 15, 2012.*

Resuscitation

- Increased ratios of plasma:RBCs and platelets:RBCs were independently associated with decreased 6-hour mortality, when hemorrhagic death predominated.

- *Holcomb JB et al Arch Surg. October 15, 2012.*

Resuscitation

- In the first 6 hours, patients with ratios less than 1:2 were 3 to 4 times more likely to die than patients with ratios of 1:1 or higher.

- *Holcomb JB et al Arch Surg. October 15, 2012.*

Resuscitation

- After 24 hours, plasma and platelet ratios were unassociated with mortality
- Nonhemorrhagic causes of death prevailed.

- *Holcomb JB et al Arch Surg. Published online October 15, 2012.*

Resuscitation

- “suggest that the association between earlier and higher ratios of plasma and platelets and decreased in-hospital mortality is concentrated in the first 6 hours in patients with substantial bleeding. “
- *Holcomb JB et al Arch Surg. Published online October 15, 2012.*

Surgery

Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

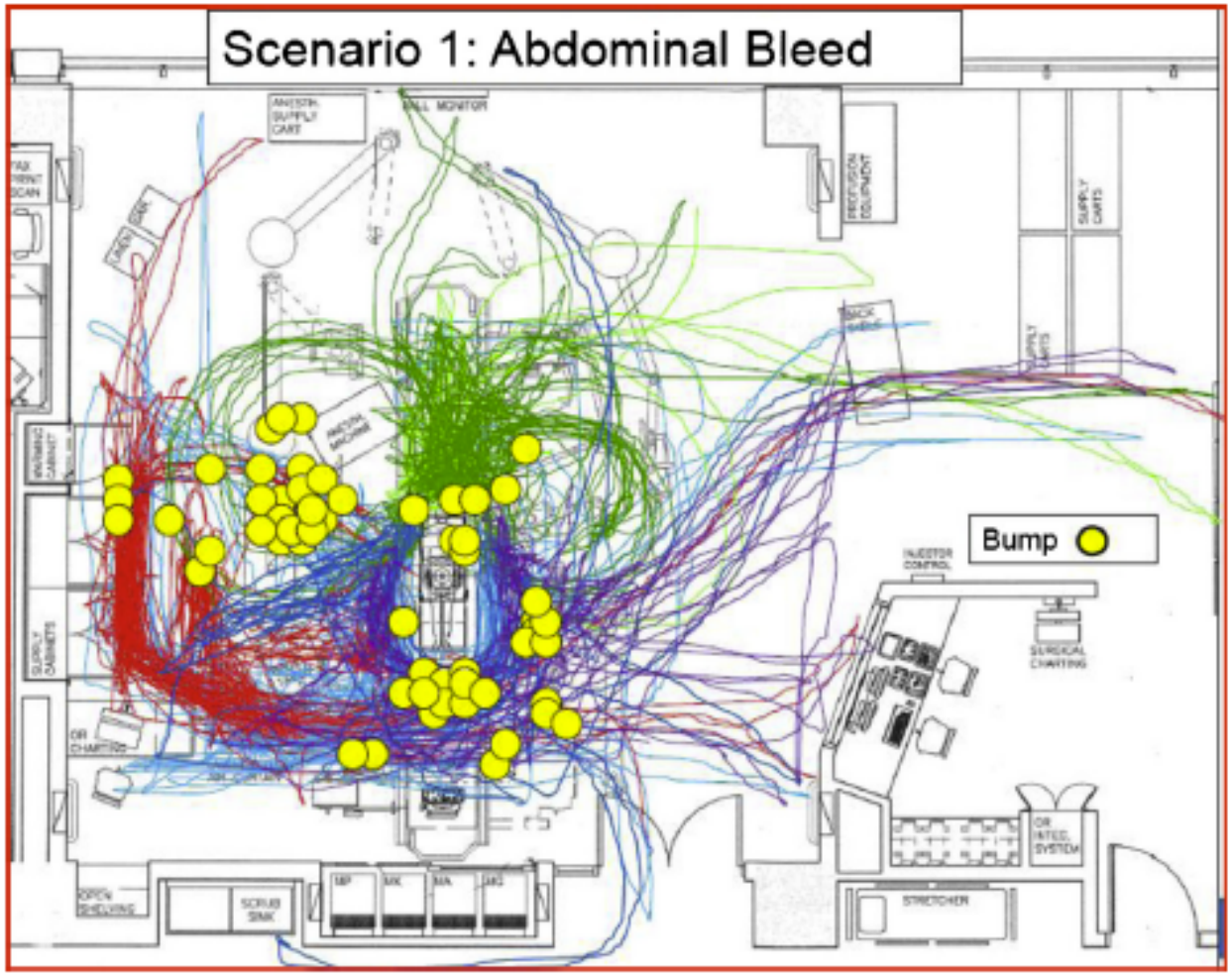
The evolution of a purpose designed hybrid trauma operating room from the trauma service perspective: The RAPTOR (resuscitation with angiography percutaneous treatments and operative resuscitations)

Andrew W. Kirkpatrick [a,d,e,f,*], Christine Vis [b], Mirette Dubé [f], Susan Biesbroek [f], Chad G. Ball [a,d,e], Jason Laberge [f], Jonas Shultz [f], Ken Rea [g], David Sadler [b,f], John B. Holcomb [h], John Kortbeek [a,c,d,e,f]

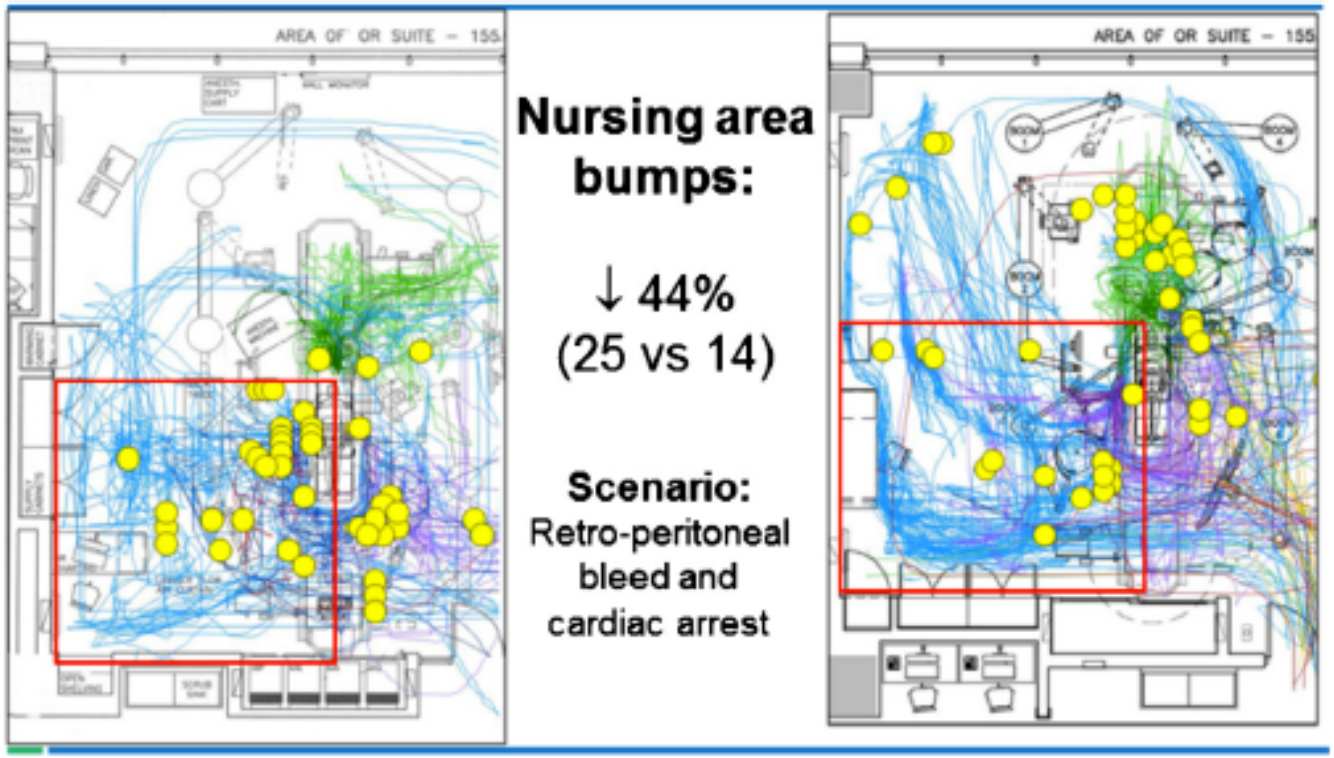
Injury, 2014 Online, in press

Surgery

A.W. Kirkpatrick et al. / Injury, Int. J. Care Injured xxx (2014) xxx–xxx



Surgery



Panel A

Panel B

Surgery

ORIGINAL ARTICLE

Nonsteroidal anti-inflammatory drugs' impact on nonunion and infection rates in long-bone fractures

David R. Jeffcoach, MD, Valerie G. Sams, MD, Christy M. Lawson, MD, Blaine L. Enderson, MD, MBA, Scott T. Smith, MD, Heather Kline, PA-C, Patrick B. Barlow, BA, Douglas R. Wylie, PharmD, Laura A. Krumenacker, PharmD, James C. McMillen, PharmD, Jordan Pyda, BS, Brian J. Daley, MD, MBA, *and* University of Tennessee Medical Center, Department of Surgery, *Knoxville, Tennessee*

- J Trauma & Acute Care Surg. 2014;76: 779-783

Surgery

TABLE 5. Adjusted ORs for Complication Occurrence (Full Model)

Variable	Adjusted OR*	95% CI		*p*
		Lower	Upper	
NSAID use	2.17	1.15	4.10	0.016
Tobacco use	3.19	1.84	5.53	<0.001
Open fracture	3.11	1.60	6.03	0.001
Fall injury	0.37	0.17	0.79	0.011
MVC injury	0.51	0.27	0.96	0.037
ISS	1.01	0.99	1.04	0.380

*Adjusted OR, odds of complication occurrence adjusting for NSAID use, ISS, tobacco use, open fracture, fall injury, and MVC injury.

Surgery

ORIGINAL SCIENTIFIC ARTICLES

Operative vs Nonoperative Management for Blunt Pancreatic Transection in Children: Multi-Institutional Outcomes

Corey W Iqbal, MD, Shawn D St Peter, MD, FACS, Kuojen Tsao, MD, FACS, Daniel C Cullinane, MD, FACS, David M Gourlay, MD, FACS, Todd A Ponsky, MD, FACS, Mark L Wulkan, MD, FACS, Obinna O Adibe, MD, on behalf of the Pancreatic Trauma in Children (PATCH) Study Group

JACS Vol. 218, No. 2, February 2014

Surgery

Table 2. Outcomes for Operative Resection vs Nonoperative Management

Characteristic	Operative resection (n = 57)	Nonoperative (n = 95)	p Value
Pseudocyst, %	0	18	0.001
Pancreatic leak, %	7	0	0.02
Overall morbidity rate, %	32	27	0.7
Need for repeat intervention, %*	2	26	0.002
Time to initial feeds, d, mean ± SE	4.5 ± 0.5	8.9 ± 1.3	0.002
Time to goal feeds, d, mean ± SE	7.8 ± 0.7	15.1 ± 2.5	0.007
Initial hospitalization, d, mean ± SE	11.9 ± 1.0	13.4 ± 1.3	0.4
Readmissions, %	20	16	0.7
Total days in-hospital, mean ± SE	13.1 ± 1.1	14.0 ± 1.1	0.6
Time to complete resolution, d, mean ± SE	22.6 ± 5.0	38.6 ± 6.4	0.05

*Excluding central venous access.

Pediatric pancreatic trauma

Op vs Non Op n = 57 vs 95

Pseudocyst 0 vs 18

Repeat intervention 2 vs 26

Initial feeds 4.5 vs 8.9 days

Complete resolution 22.6 vs 38.6 days

Pediatric pancreatic trauma

- Blunt pancreatic transection with main duct involvement is best managed with resection because this treatment.
- Patients without main duct injury do just as well with nonoperative management compared with resection.
- Define the duct.

Critical Care

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JUNE 6, 2013 VOL. 368 NO. 23

Prone Positioning in Severe Acute Respiratory Distress Syndrome

- Guerin C, et al NEJM 368;23 June 6, 2013

Critical Care

Multicenter, prospective, RCT
466 patients with severe ARDS prone-positioning sessions of at least 16 hours or to be left in the supine position.
Severe ARDS PaO2/FiO2 < 150 mm Hg, Fio2 > 0.6, a PEEP >/=5 cm of water, TV 6 ml per kilogram ideal wt.

Primary outcome 28 day all cause mortality

- Guerin C et al NEJM 368;23 june 6, 2013

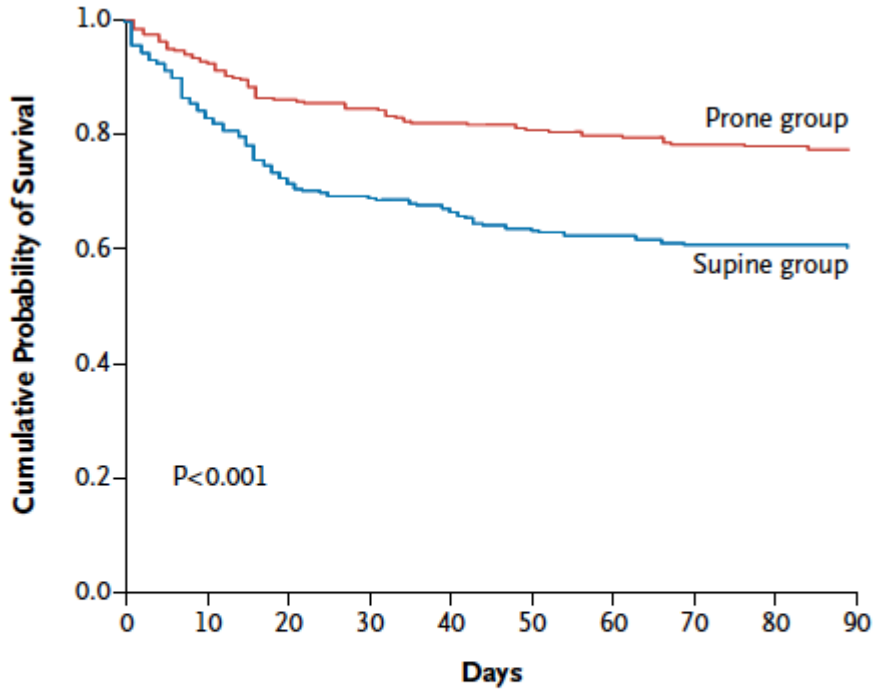
Critical Care

Unadjusted 90-day mortality
23.6% in the prone group
41.0% in the supine group (P<0.001)

Complications No significant difference
Except cardiac arrests, -higher in the supine group.

- Guerin C et al NEJM 368;23 June 6, 2013

Critical Care



No. at Risk

Prone group	237	202	191	186	182
Supine group	229	163	150	139	136

Figure 2. Kaplan–Meier Plot of the Probability of Survival from Randomization to Day 90.

NEJM 368;23 June 6, 2013

Critical Care Proning

Prone video you tube. http-//www.youtube.com/watch?v=Hd5o4ldp3c0

Critical Care

Intracranial pressure monitoring in severe head injury: compliance with Brain Trauma Foundation guidelines and effect on outcomes: a prospective study

Clinical article

- *Talving P et al, J Neurosurg / August 23, 2013*

Critical Care

- Prospective, observational study including patients with severe blunt TBI (GCS ≤ 8, Head AIS ≥ 3) 2010-2011
- ICP monitoring and no ICP monitoring.
- Primary outcomes - compliance with BTF guidelines, in-hospital mortality, & mortality - brain herniation. Secondary outcomes - ICU and hospital LOS
- *Talving P et al, J Neurosurg / August 23, 2013*

Critical Care

- 216 patients met the BTF guideline criteria for ICP monitoring.
- Compliance with BTF guidelines was 46.8% (101 patients).

- *Talving P et al, J Neurosurg / August 23, 2013*

Critical Care

- SAH & and craniectomy/craniotomy were significantly more likely to undergo ICP monitoring.
- Hypotension, coagulopathy, and increasing age were negatively associated with the placement of ICP monitoring devices.

- *Talving P et al, J Neurosurg / August 23, 2013*

Critical Care

- In-hospital mortality - higher in patients who did not undergo ICP monitoring (53.9% vs 32.7%, adjusted p = 0.019).
- mortality due to brain herniation was higher for the group not undergoing ICP monitoring (21.7% vs 12.9%, adjusted p = 0.046).

- *Talving P et al, J Neurosurg / August 23, 2013*

Critical Care

- The ICU and hospital lengths of stay were significantly longer in patients subjected to ICP monitoring.

- *Talving P et al, J Neurosurg / August 23, 2013*

Prevention

VIEWPOINT

ONLINE FIRST

Curbing Gun Violence
Lessons From Public Health Successes

- Mozaffarian, D et al, JAMA, February 13, 2013—Vol 309, No. 6

Prevention

- Deaths - US 30 000 / year (homicides, suicides, and unintentional fatalities)
- 85 deaths per day plus many hundreds of nonfatal injuries
- Mozaffarian, D et al, JAMA, February 13, 2013—Vol 309, No. 6

Prevention

- Focus on gun ownership - controversial due to Second Amendment interpretations and regional, partisan, and personal preferences
- Gun violence - sociocultural, educational, behavioral, and product safety issues - transcend gun ownership
- Mozaffarian, D et al, JAMA, February 13, 2013—Vol 309, No. 6

Prevention

- Lessons from public health initiatives on MVC, poisoining and tabacco
- Menu – selection of strategies that are feasible in different juridictions.
- Media, education, engineering, taxation, magazine clip design,storage regs, age restrictions, safety classes, smart guns, licensure, advocacy.

- Mozaffarian, D et al, JAMA, February 13, 2013—Vol 309, No. 6

Prevention

- Primary goal is to reduce gun violence.

- Mozaffarian, D et al, JAMA, February 13, 2013—Vol 309, No. 6