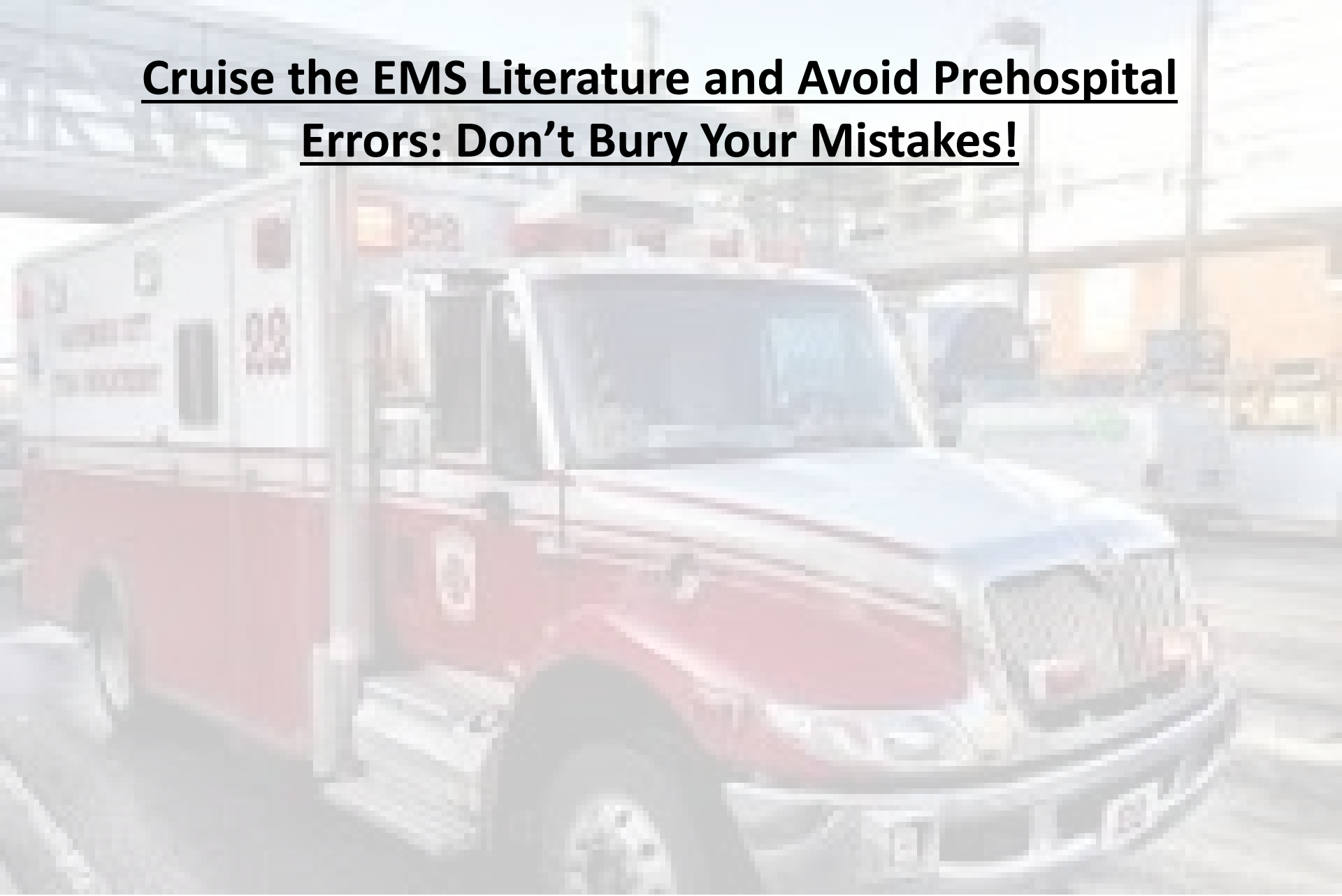
Cruise the EMS Literature and Avoid Prehospital Errors: Don't Bury Your Mistakes!



Benjamin J. Lawner, DO, MS, EMT-P, FACEP, FAAEP
Assistant Professor, Department of Emergency Medicine
Deputy Medical Director, Baltimore City Fire Department


BALTIMORE
Greatest City in America
BALTIMORE

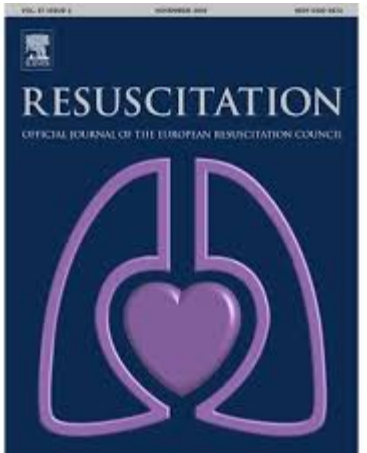
Objectives

- Discuss the importance of literature review and identify EMS peer reviewed resources
- Examine the latest trends in prehospital airway management
- Describe important outcomes related to prehospital 12 lead electrocardiography
- Understand other topics of interest discussed in the 2014 EMS / resuscitation literature

Know Where to Get Your Literary Fix!

Peer Reviewed Resources

JEMS
JOURNAL OF EMERGENCY MEDICAL SERVICES



Access

- Medical director
- Librarian
- Online forums (vetted peer review sites)
- Instructor
- www.pubmed.com
- www.emedicine.com

SCOPUS™ Find out.

PubMed

Drop that tube and slap on the pap!

Academic Emergency Med 2014

Academic Emergency Medicine
Official Journal of the Society for Academic Emergency Medicine

PROGRESSIVE CLINICAL PRACTICE

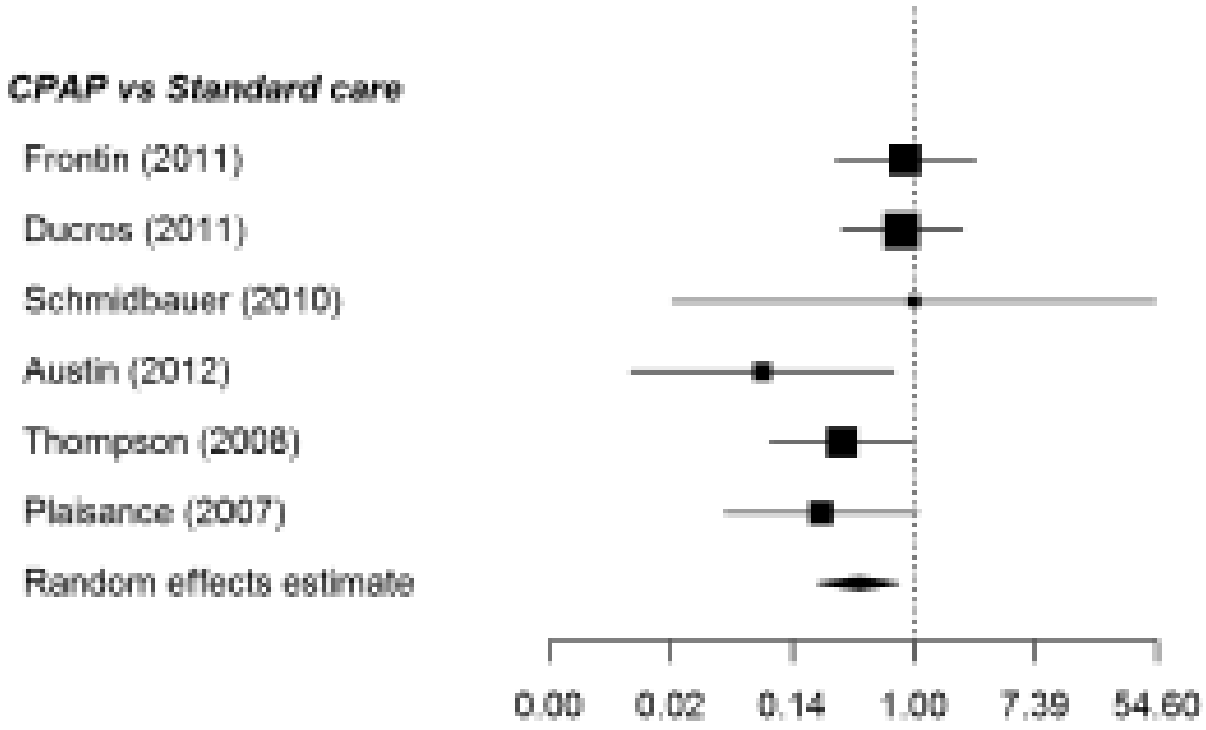
Prehospital Noninvasive Ventilation for Acute Respiratory Failure: Systematic Review, Network Meta-analysis, and Individual Patient Data Meta-analysis

Steve Goodacre, PhD, John W. Stevens, PhD, Abdullah Pandor, MSc, Edith Poku, MBChB, Shijie Ren, PhD, Anna Cantrell, MA, Vincent Bounes, PhD, Arantxa Mas, MD, Didier Payen, PhD, David Petrie, MD, Markus Soeren Roessler, PhD, Gunther Weitz, MD, Laurent Ducros, MD, and Patrick Plaisance, PhD

Methods

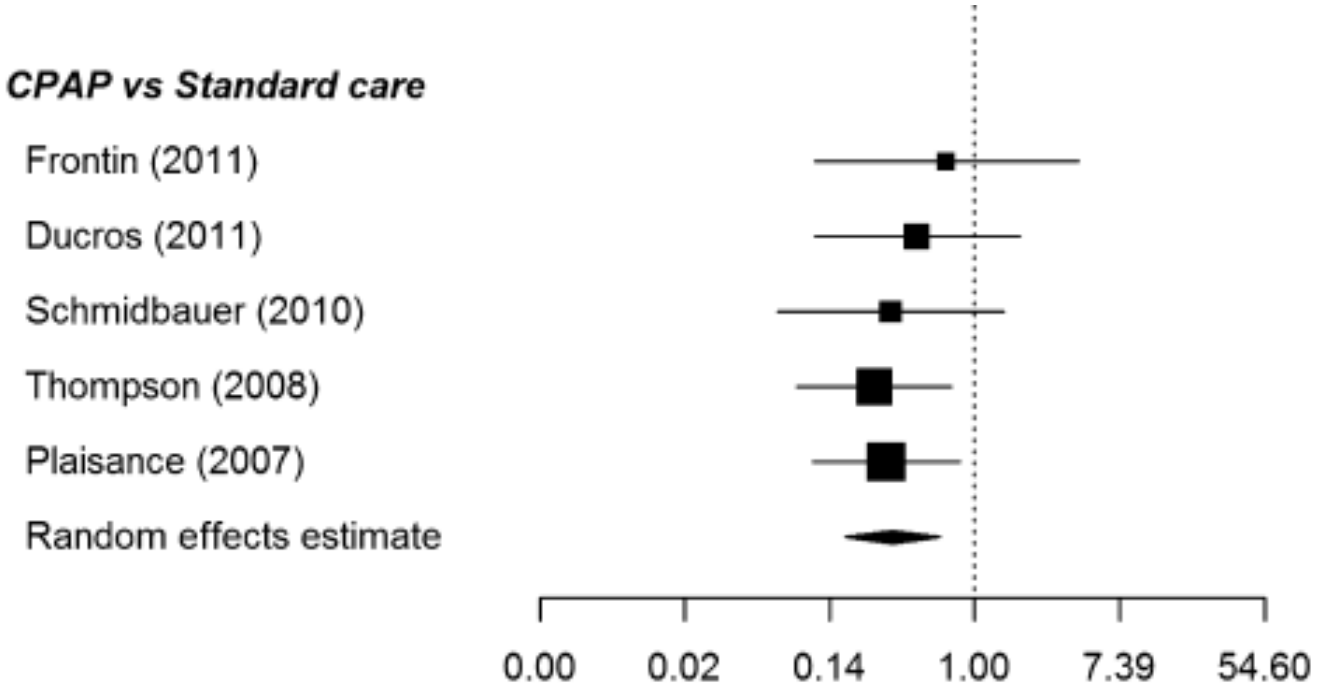
- Eight randomized trials
- CPAP and BiPAP
- Focused exclusively on pre-hospital
- Effect on mortality
- Effect on intubation rate

Mortality: CPAP vs Standard Care



CPAP was more effective than the usual prehospital care in terms of mortality.

Intubation rate: CPAP vs Standard Care



When compared to usual care, prehospital CPAP decreases intubation rates.

Take Home: NIV

- Role of BiPAP unclear
- CPAP reduces mortality
- CPAP benefits in undifferentiated resp distress

Sound Familiar?

PREHOSPITAL EMERGENCY CARE 2013;17:261–273

PREHOSPITAL CONTINUOUS POSITIVE AIRWAY PRESSURE FOR ACUTE RESPIRATORY FAILURE: A SYSTEMATIC REVIEW AND META-ANALYSIS

Teresa A. Williams, PhD, MHlthSci (Res), PG Dip Clin Epi, BN, ICU Cert, RN, Judith Finn, PhD, MEdSt, GradDipPH, BSc, DipAppSc, RN, RM, ICCert, FRCNA, Gavin D. Perkins, PhD, MBBS, Ian G. Jacobs, BAppSc, DipEd, PhD, RN, FRCNA, FACAP, FERC

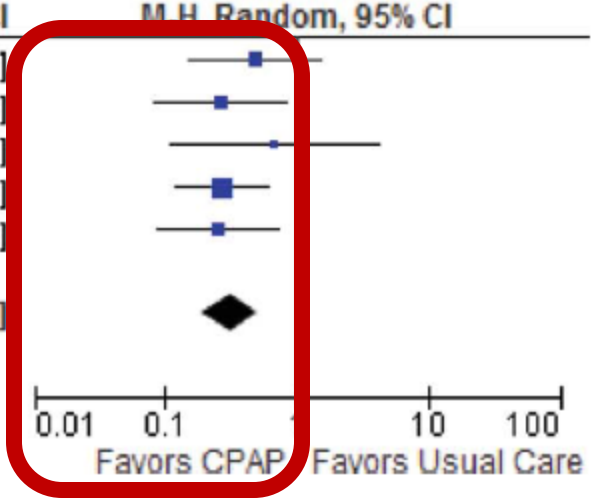
- Meta analysis
- 1002 patients
- 471 receiving CPAP
- Majority of patients with pulmonary edema

Prehospital CPAP

Study or Subgroup	CPAP Events	CPAP Total	Usual Care Events	Usual Care Total	Weight	Odds Ratio M-H, Random, 95% CI
Dib	4	149	13	238	18.0%	0.48 [0.15, 1.49]
Ducros	4	107	13	100	17.5%	0.26 [0.08, 0.83]
Frontin	2	60	3	62	7.0%	0.68 [0.11, 4.21]
Hubble	10	120	24	95	36.9%	0.27 [0.12, 0.60]
Thompson	7	35	17	34	20.6%	0.25 [0.09, 0.73]
Total (95% CI)		**471**		**529**	**100.0%**	**0.31 [0.19, 0.51]**
Total events	27		70			

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 1.63$, $df = 4$ ($P = 0.80$); $I^2 = 0\%$

Test for overall effect: $Z = 4.73$ ($P < 0.00001$)



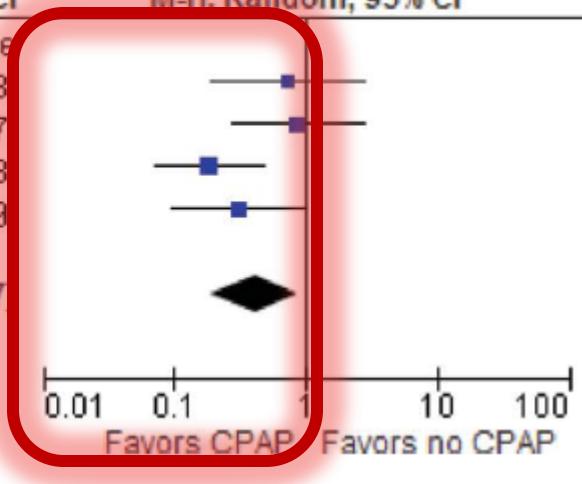
Effect of CPAP on risk of intubation

Prehospital CPAP

Study or Subgroup	CPAP Events	CPAP Total	Usual Care Events	Usual Care Total	Weight	Odds Ratio M-H, Random, 95% CI
Dib	0	149	0	238		Not estimable
Ducros	4	107	5	100	20.6%	0.74 [0.19, 2.83
Frontin	6	60	7	62	24.8%	0.87 [0.28, 2.77
Hubble	6	120	21	95	30.4%	0.19 [0.07, 0.48
Thompson	5	35	12	34	24.2%	0.31 [0.09, 0.99
Total (95% CI)		**471**		**529**	**100.0%**	**0.41 [0.19, 0.87**
Total events	21		45			

Heterogeneity: Tau² = 0.26; Chi² = 5.25, df = 3 (P = 0.15); I² = 43%

Test for overall effect: Z = 2.32 (P = 0.02)

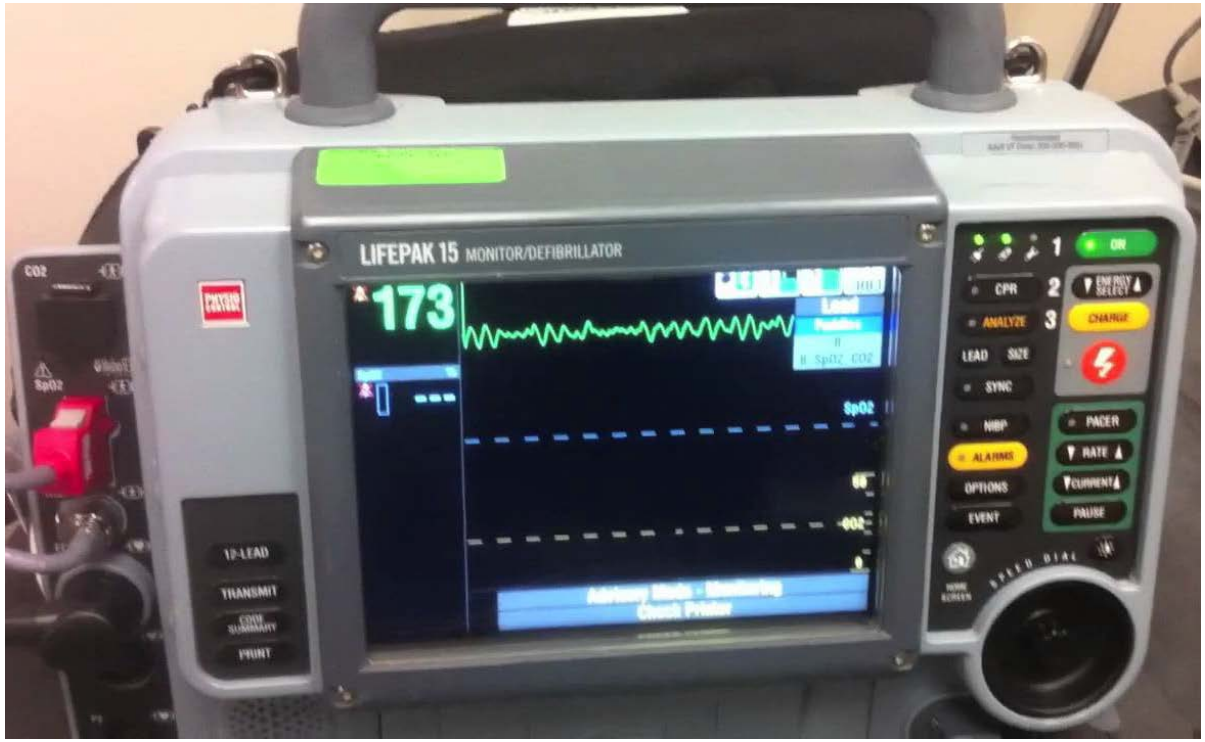


Effect of continuous positive airway pressure on mortality

Discussion and Take Home

- CPAP early
- CPAP aggressively
- CPAP for all causes of respiratory failure
- Reduction in mortality
- Reduction in intubation

Don’t forget the monitor!



Why do the 12 lead?

ORIGINAL CONTRIBUTIONS

EFFECT OF PREHOSPITAL CARDIAC CATHETERIZATION LAB ACTIVATION ON DOOR-TO-BALLOON TIME, MORTALITY, AND FALSE-POSITIVE ACTIVATION

Benjamin T. Squire, MPH, Joshua H. Tamayo-Sarver, PhD, Paula Rashi, RN, William Koenig, MD, James T. Niemann, MD

PREHOSPITAL EMERGENCY CARE 2014;18:1–8

The Scope of the Problem

- 500,000 STEMI patients per year!
- 60% transported by EMS
- PCI is definitive treatment
- Time critical intervention

Study Setting: Data Collection

- Los Angeles County EMS database
- 9.8 million residents
- 549,732 EMS responses
- 3052 patients from 05/2008→08/2009
- Activation based upon:

*****ACUTE MI SUSPECTED*****

RESULTS

- Mean D2B 13 mins less
- EMS 8% more likely to meet D2B
- Mortality higher in EMS group

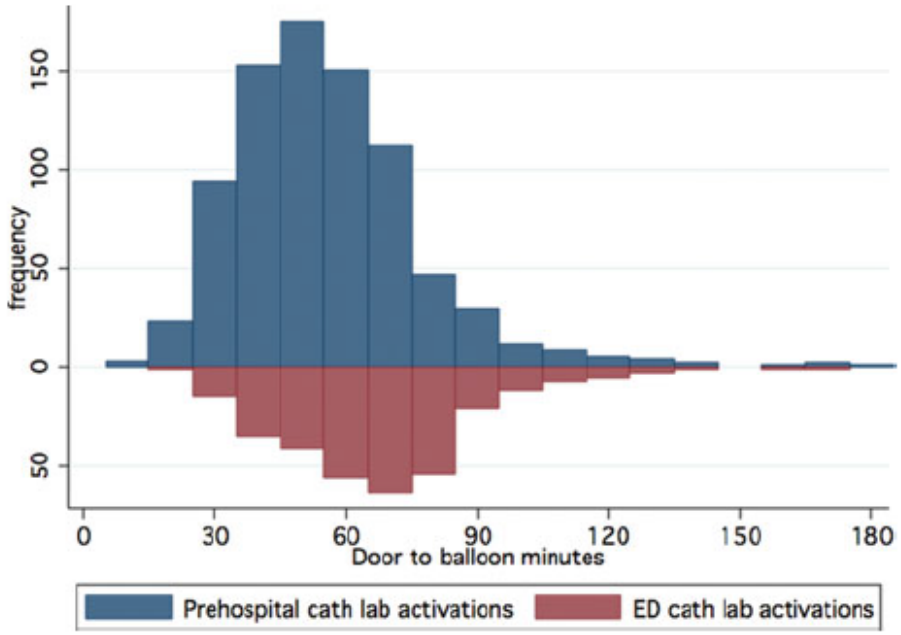
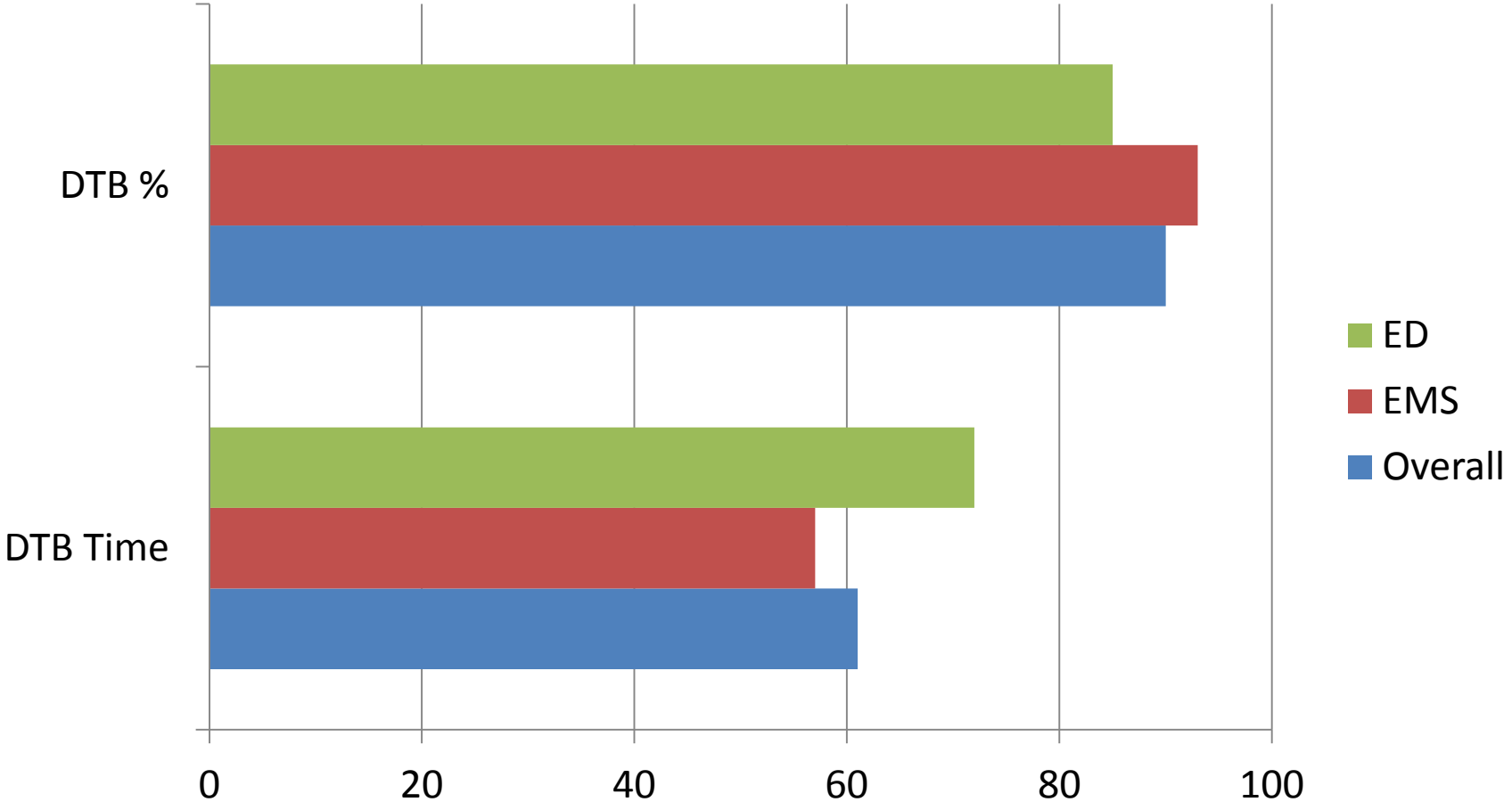


FIGURE 2. Distribution of door to balloon times by mode of activation.

EMS vs ED Activations



Areas of Concern

- High percentage (33%) of false positives
- No prehospital ECG transmission
- Implemented following study's conclusion

Missing the Mark

Academic Emergency Medicine
Official Journal of the Society for Academic Emergency Medicine

ORIGINAL CONTRIBUTION

Use of Prehospital 12-Lead Electrocardiography and Treatment Times Among ST-Elevation Myocardial Infarction Patients With Atypical Symptoms

Austin R. Cannon, Li Lin, MS, Barbara Lytle, MS, Eric D. Peterson, MD, MPH, Charles B. Cairns, MD, and Seth W. Glickman, MD, MBA

- Statewide EMS database
- 2,639 STEMI patients

Results

- 12.1% had NO chest pain
- 87% of CP patients had prehospital ECG
- 72.3% of patients without CP had prehosp ECG
- Longer FMC to device times

ed atypically?

Good thing I'm male with retrosternal crushing chest discomfort.

- Elderly
- Female
- Diabetic

Why Waste the Time?

- Better door to balloon times
- Better patient outcomes
- Faster delivery to definitive care
- Potential for decreased infarct size

Don’t Arrest Patient Progress!

Its All About the Epi!

Atiksawedparit *et al. Critical Care* 2014, **18**:463
http://ccforum.com/content/18/4/463

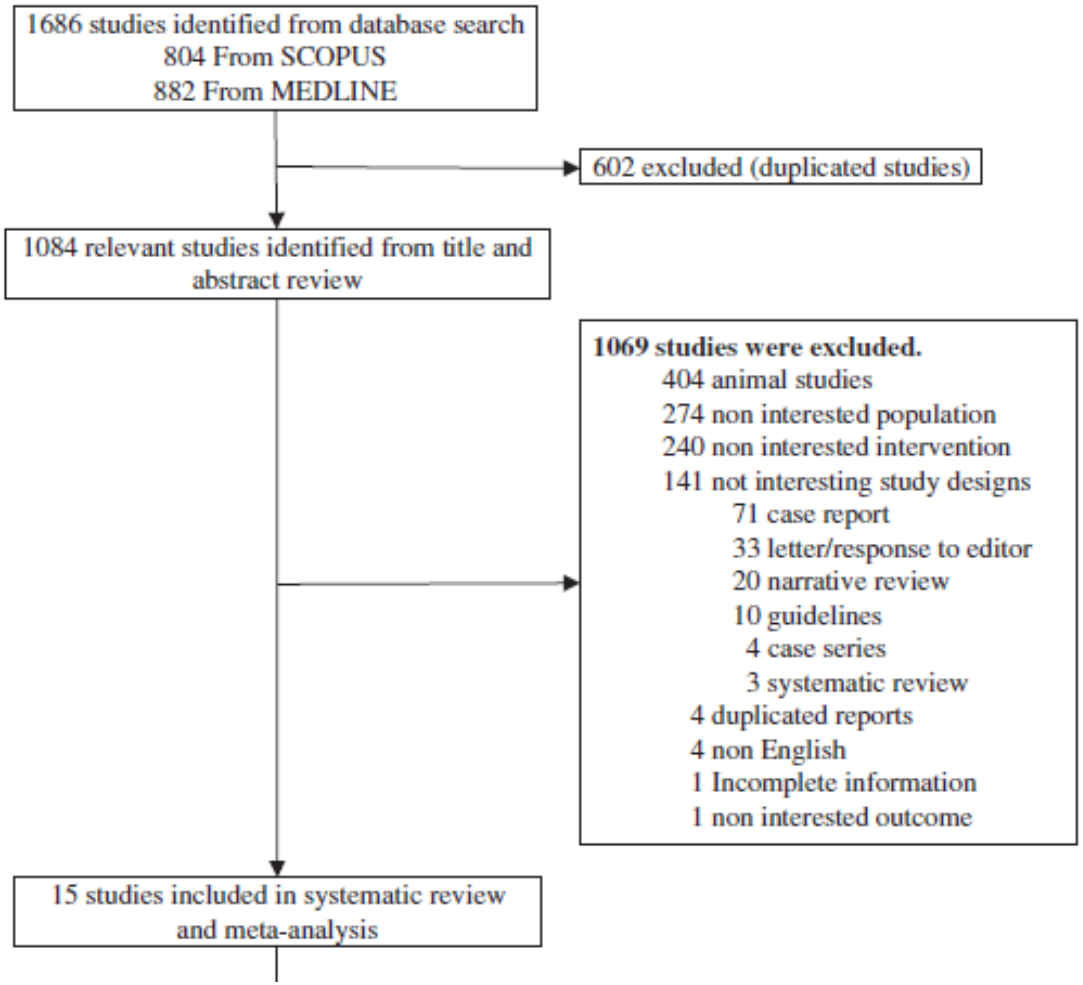
RESEARCH Open Access

Effects of prehospital adrenaline administration on out-of-hospital cardiac arrest outcomes: a systematic review and meta-analysis

Pongsakorn Atiksawedparit[1,2], Sasivimol Rattanasiri[1*], Mark McEvoy[3], Colin A Graham[4], Yuwares Sittichanbuncha[2] and Ammarin Thakkinstian[1]

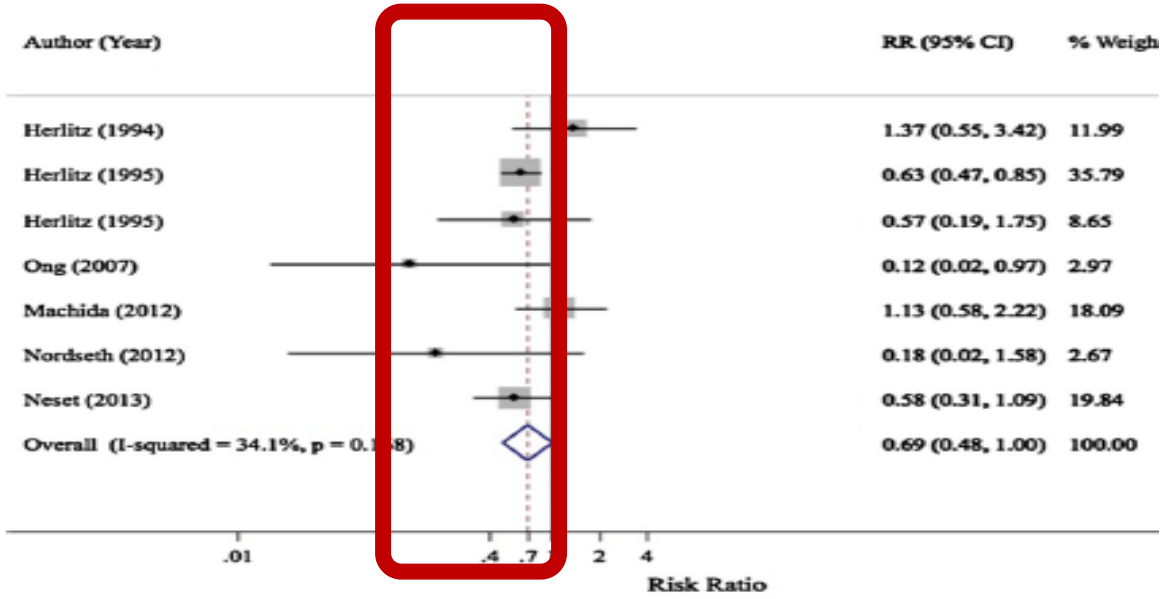
Prehospital Epinephrine

- 15 studies
- Meta analysis



Outcomes of Interest

- Increased prehospital ROSC
- Decreased survival to discharge
- No differences in hospital admission



Discussion and Take Home

- Benefits of routine epi unclear
- No reduction in mortality
- Some studies suggest benefit with early admin

The Tube that Won't Go Away

Resuscitation 85 (2014) 617–622

Contents lists available at ScienceDirect

Resuscitation

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

Clinical paper

Airway management and out-of-hospital cardiac arrest outcome in the CARES registry☆

Jason McMullan[a,*], Ryan Gerecht[a], Jordan Bonomo[a], Rachel Robb[b], Bryan McNally[b], John Donnelly[c], Henry E. Wang[c], On behalf of the CARES Surveillance Group

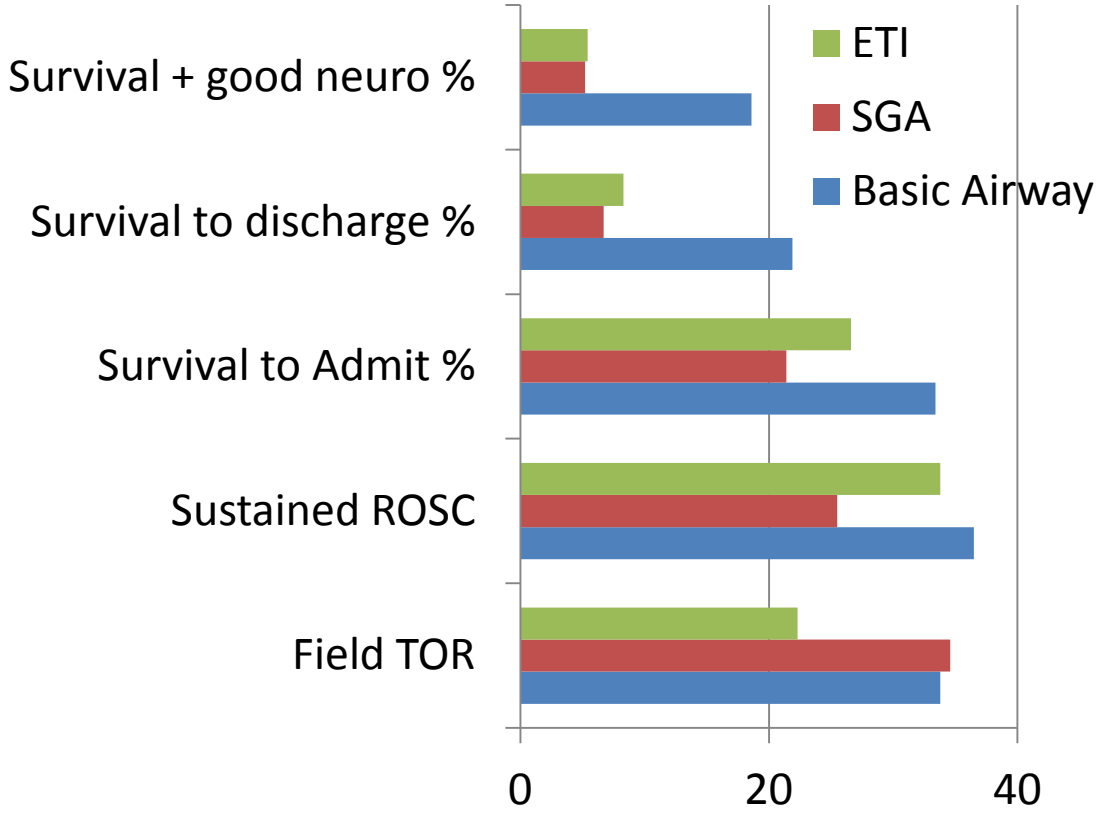
[a] *Department of Emergency Medicine, University of Cincinnati, United States*
[b] *Department of Emergency Medicine, Emory University, United States*
[c] *Department of Emergency Medicine, University of Alabama School of Medicine, United States*

CARES and Cardiac Arrest

- Voluntary, nationwide registry
- 10,691 cases of OHCA
- 5591 received ETI
- 3110 received SGA
- 1929 received no advanced airway
- Adults > 18

Table 3
Unadjusted outcomes after out-of-hospital cardiac arrest in the CARES network. Cells reflect column percentages. *P*-values based upon chi-square test.

Outcome	No advanced airway ($n = 1929$)	Supraglottic airway ($n = 3110$)	Endotracheal intubation ($n = 5591$)
Field termination of resuscitation (%)	33.8	34.6	22.3
Sustained ROSC (%)	36.5	25.5	33.8
Survival to hospital admission (%)	33.4	21.4	26.6
Survival to hospital discharge (%)	21.9	6.7	8.3
Survival to hospital discharge with good neurologic outcome (%)	18.6	5.2	5.4



Take Home Points

- No imperative for SGA
- Unclear benefit for ETI
- Survival differences between SGA and ETI limited to patients with a shockable rhythm
- Survival highest with NO advanced airway

Just Chill Out Already!

Hypothermia in 2014

- Widespread implementation
- Ice packs
- Saline
- EMS and in-hospital uses
- Positive outcomes

Chilling Questions

- Is there an imperative for EMS to cool?
- What is the best method for cooling?
- Any negative effects?

Journal of the American Medical Association 2014

Original Investigation

Effect of Prehospital Induction of Mild Hypothermia on Survival and Neurological Status Among Adults With Cardiac Arrest
A Randomized Clinical Trial

Francis Kim, MD; Graham Nichol, MD, MPH; Charles Maynard, PhD; Al Hallstrom, PhD; Peter J. Kudenchuk, MD; Thomas Rea, MD, MPH; Michael K. Copass, MD; David Carlbom, MD; Steven Deem, MD; W. T. Longstreth Jr, MD; Michele Olsufka, RN; Leonard A. Cobb, MD

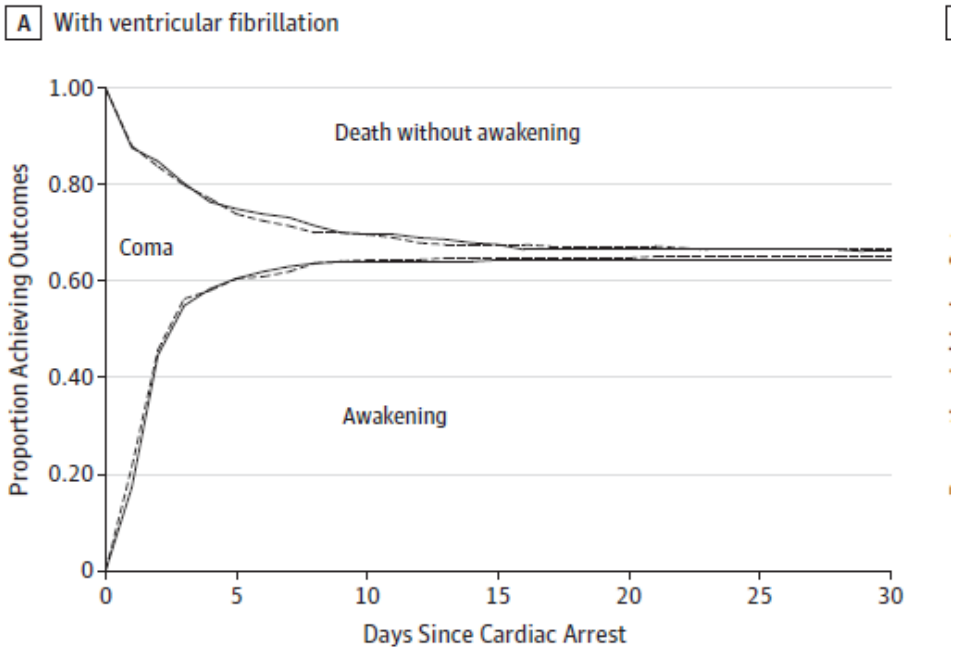
- King County, WA
- 1359 EMS cardiac arrest patients randomized
- December 2007-2012
- Nearly all VF patients received in hospital cooling irrespective of randomization

Hypothermia Outcomes

- Survival to discharge
- Neurological status at discharge
- ***NOT ROSC!***

Figure 6. Ice packs to the head.

VF Arrest + Cooling



- 62.7% survived to discharge
- 42.8% full neurological recovery
- 15% with mild impairment
- 2.1% with severe impairment

But…

Table 3. Prehospital, Emergency Department, and In-Hospital Safety Data

	Intervention	Control	*P* Value
Rearrest postrandomization[a]	(n = 686) 176 (26) [22 to 29]	(n = 671) 138 (21) [18 to 24]	.008
Pulmonary edema			
First chest film[a]	(n = 631) 256 (41) [37 to 44]	(n = 609) 184 (30) [27 to 34]	<.001

Prehospital cooling:

→ increased incidence of re-arrest

→ Increased incidence of pulmonary edema

→ No improvement in neurologic status (VF and non VF)

Considerations and Limitations

- High performing EMS system
- Unusually high survival rates
- Unclear if intervention caused outcomes
- Effect of cooled, rapid infusion of IV saline unclear
  → acidosis
  → reperfusion injury

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Targeted Temperature Management at 33°C versus 36°C after Cardiac Arrest

N ENGL J MED 369;23 NEJM.ORG DECEMBER 5, 2013

Study Design

- 950 unconscious survivors of OOHCA
- Assigned to TTM at 33 or 36 degrees C
- All cause mortality
- Neurologic function
- 36 ICUs in Europe and Australia

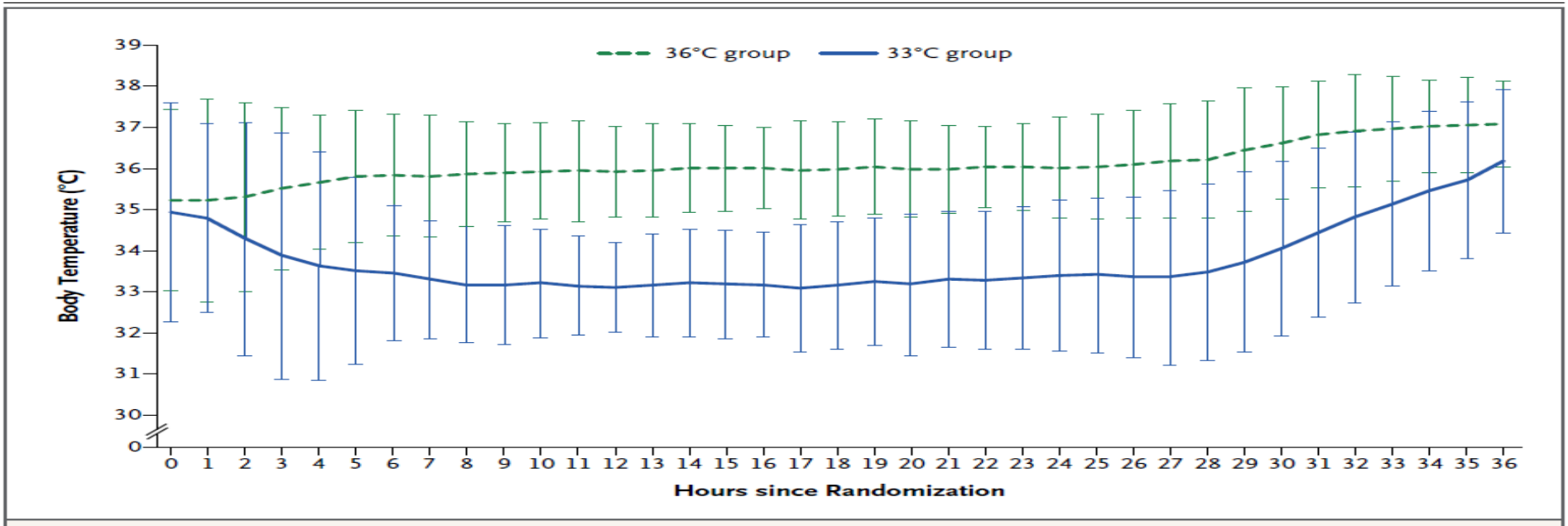


Figure 1. Body Temperature during the Intervention Period.

Outcomes

Table 2. Outcomes.

Outcome	33°C Group	36°C Group	Hazard Ratio or Risk Ratio (95% CI)*	P Value
	no./total no. (%)			
Primary outcome: deaths at end of trial	235/473 (50)	225/466 (48)	1.06 (0.89–1.28)	0.51
Secondary outcomes				
Neurologic function at follow-up†				
CPC of 3–5	251/469 (54)	242/464 (52)	1.02 (0.88–1.16)	0.78
Modified Rankin scale score of 4–6	245/469 (52)	239/464 (52)	1.01 (0.89–1.14)	0.87
Deaths at 180 days	226/473 (48)	220/466 (47)	1.01 (0.87–1.15)	0.92

Key Points from the TTM Trial

- No differences in survival
- No differences in neurological outcome
- No support for lower target

So… How Low Do We Go?

?

→ No clear imperative for EMS to cool
→ No clear endorsement of best method for cooling
→ Cooling SHOULD begin in-hospital
→ Transport directed to centers capable of cooling / post arrest care


Come on Facebook...
just forty more "likes" and I can save that little girl's life.
ENDLESSPICDUMP.COM

Got dilaudid?
Prehospital pain management 2014

An Evidence-based Guideline for Prehospital Analgesia in Trauma

Marianne Gausche-Hill, MD, Kathleen M. Brown, MD, Zoë J. Oliver, MD, CCFP (EM), Comilla Sasson, MD, MS, Peter S. Dayan, MD, MSc, Nicholas M. Eschmann, EMT-P, MS (Epidemiology), Tasmeen S. Weik, DrPh, MPH, Benjamin J. Lawner, DO, EMT-P, FAAEM, Ritu Sahni, MD, MPH, Yngve Falck-Ytter, Joseph L. Wright, MD, MPH, Knox Todd, MD, MPH, Eddy S. Lang, MDCM, CCFP (EM)

Prehospital Emergency Care 2014

EMS physicians

Pain medicine specialists

EMS providers

Pediatric emergency medicine physicians

Evidence based guideline review

Adverse Effects and Relative Contraindications

Sedation
Hypotension
SPO_2< 90%
Allergy
Condition preventing administration (blocked nose, no IV)

(Weak recommendation, very low quality evidence)

INTERNATIONAL EMS

A COMPARISON OF KETAMINE AND MORPHINE ANALGESIA IN PREHOSPITAL TRAUMA CARE: A CLUSTER RANDOMIZED CLINICAL TRIAL IN RURAL QUANG TRI PROVINCE, VIETNAM

Kim Phung Tran, MD, PhD, Quynh Nguyen, MD, MPH, Xuan Nhuan Truong, MD, Viet Le, MSci, Van Phu Le, MD, Nam Mai, MD, MPH, Hans Husum, MD, PhD, Ole Kristian Losvik, MD

PREHOSPITAL EMERGENCY CARE 2014;18:257–264

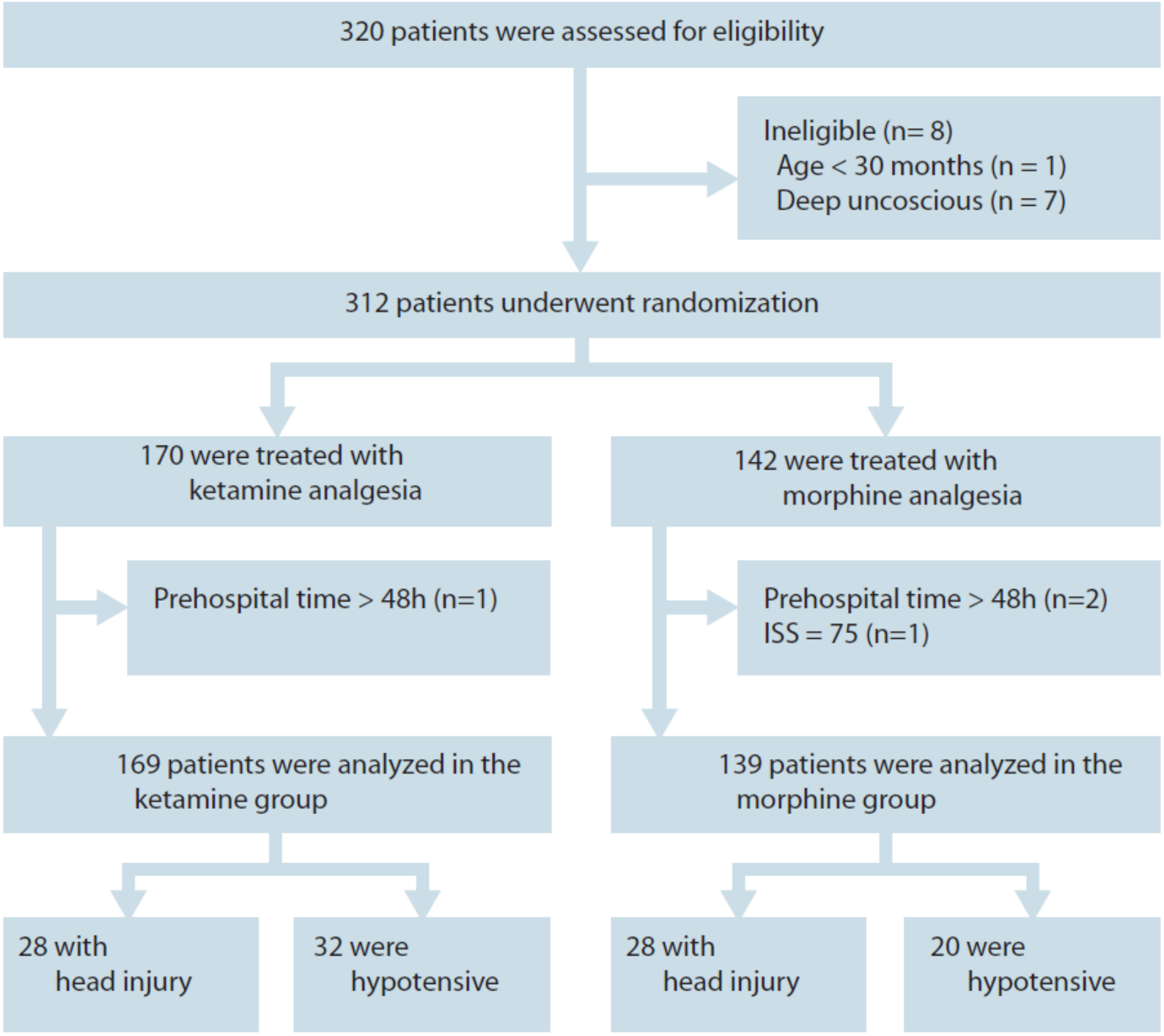
Why is Pain Control Important?

Background

Efficient pain relief is crucial when providing primary life support to trauma victims. Acute pain makes breathing efforts inefficient, thereby adversely affecting oxygenation. Persistent pain and anxiety also cause the postinjury release of chemical triggers, which can induce postinjury stress responses. If uncontrolled, the postinjury stress response is a major risk factor for postinjury organ failure and trauma-related death.[1,2]

Study Background

- Trauma patients in Vietnam
- Prospective trial of ketamine vs morphine
- Clinical endpoints
- Vomiting, salivation
- Blood pressure change
- Pain reduction


320 patients were assessed for eligibility
Ineligible (n= 8)
Age < 30 months (n = 1)
Deep uncoscious (n = 7)
312 patients underwent randomization
170 were treated with ketamine analgesia
142 were treated with morphine analgesia
Prehospital time > 48h (n=1)
Prehospital time > 48h (n=2)
ISS = 75 (n=1)
169 patients were analyzed in the ketamine group
139 patients were analyzed in the morphine group
28 with head injury
32 were hypotensive
28 with head injury
20 were hypotensive

Design Limitations

Intervention

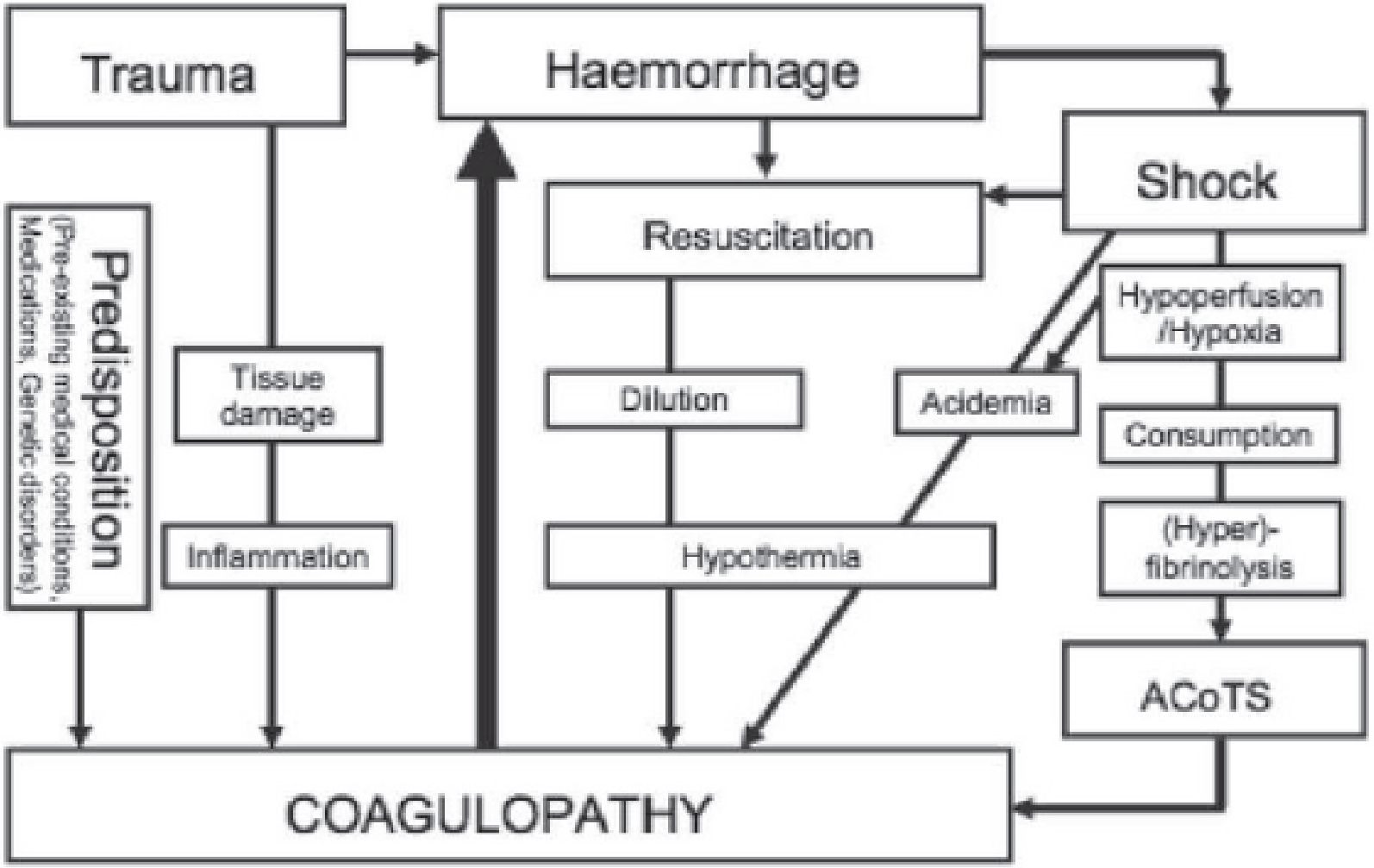
Before conducting the study, all participating doctors underwent 1 week of training in advanced trauma life support by the authors (NQ, TXN, LVP). The training included the effects and side effects of ketamine and the measurement of pain. Ketamine was administered as slow intermittent intravenous injections of doses of 0.2–0.3 mg/kg. Atropine and diazepam were not part of the treatment protocol. Morphine was administered in one single intramuscular dose of 10 mg for adult patients and 5 mg for child casualties, in accordance with the national guidelines.

Special-K

- Improved analgesia
- Less hypotension
- Less N/V (27 in Morphine group, 8 in Ketamine)
- No respiratory depression
- Increased agitation

Transexamic Acid

Figure 1. Acute Coagulopathy of Trauma Shock (Reprinted with permission[15])

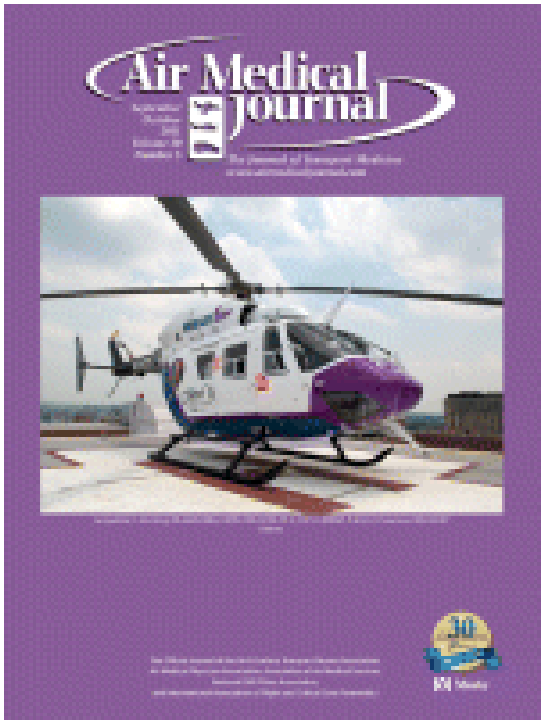


ORIGINAL RESEARCH

Prehospital Use of Tranexamic Acid for Hemorrhagic Shock in Primary and Secondary Air Medical Evacuation

Erik Nelson Vu, CCP, MD, FRCPC, DAvMed,[1,2,3] Rob S. Schlamp, CCP,[1] Robert T. Wand, CCP,[1] Geoff A. Kleine-Deters, CCP, RN,[1] Mark P. Vu, MD, FRCPC,[1,4] and John M. Tallon, MD, MSc, FRCPC[1,2,5]

- Integration of TXA into protocol
- Early use for massive hemorrhage
- 13 instances of TXA
- Progressive flight protocols:
  → 24 hour medical oversight
  → Permissive hypotension

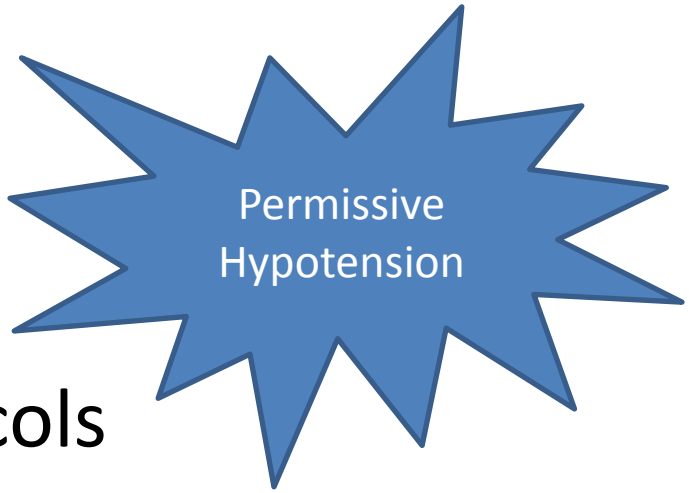


Inclusion for TXA

- Age > 16
- Major trauma (a-priori or by mechanism)
- HR > 100 bpm
- SBP < 90 mm Hg

Outcomes

- “No complications”
- Integrated into existing protocols
- 1g loading dose administered
- Average time to TXA: 32 minutes



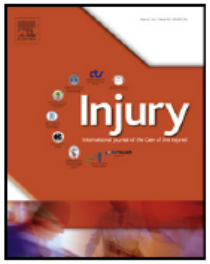
What About Clinical Outcomes?

Injury, Int. J. Care Injured 45 (2014) 66–70

Contents lists available at ScienceDirect

Injury

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



Tranexamic acid in the prehospital setting: Israel Defense Forces' initial experience

Ari M. Lipsky [a,1], Amir Abramovich [a,1], Roy Nadler [a], Uri Feinstein [a], Gadi Shaked [b], Yitshak Kreiss [c], Elon Glassberg [a,*]

[a] *Trauma & Combat Medicine Branch, Medical Corps, Israel Defense Forces, Israel*
[b] *Department of Surgery, Soroka Medical Center, Beer-Sheba, Israel*
[c] *Surgeon General's Headquarters, Medical Corps, Israel Defense Forces, Israel*

Study Background

- December 2011- February 2013
- All IDF patients receiving TXA
- Administered in accordance with IDF protocol

1. Any penetrating injury to the torso, including the neck, axillae, groin, and buttocks.
2. Blunt or penetrating injury accompanied by signs of shock. Shock was defined as the presence of any of the following: systolic blood pressure (SBP) <90 mmHg, heart rate (HR) >100 beats per minute on repeated measurement, delayed capillary refill (>2 s), or altered level of consciousness in a casualty

Results

- 40 verified reports of TXA
- Penetrating trauma in 22 (55%) of cases
- Blunt trauma in 18 (45%) of cases
- 10 casualties received morphine
- 8/22 casualties transported by HEMS received PRBC
- 33 patients received TXA within an hour

Results

- No delays resulting from TXA
- Mortality benefit conferred at 24-48 hours
- Successful integration into existing protocol
- Liberal use observed, deviation from protocol
- Endorsement of TXA for civilian use

TXA Crashes the Party

In a large, placebo controlled trial, “CRASH-2”, the early use of TXA was associated with:

- Reduced need for blood transfusions
- Improved mortality
- Cost effectiveness
- No increase in thromboembolic events

Thank You!

blawn001@umaryland.edu