

Controversies in EMS Trauma Care

Why what you've always done may not be what you ought to do

Presented by

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Goals and Objectives of this Presentation

Challenge the EMS provider to examine current practices and beliefs in trauma care in light of latest evidence. At the end of this discussion the EMS provider will

- *Understand the role of evidence based practice in EMS*
- *Be able to integrate guidelines from NYS, BTF, NAEMT, and others into daily practice more effectively*
- *List at least three things they will consider doing differently in light of current research.*

How Change Occurs vs. How EMS Systems Adapt



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EMS: Receptive to New Ideas



Consensus and Cooperation in EMS



Evidence-Based Practice

- “The conscientious, explicit and judicious use of current best evidence in making decisions about the care of the individual patient. It means integrating individual clinical expertise with the best available external clinical evidence from systematic research.”

-David Sackett, MD

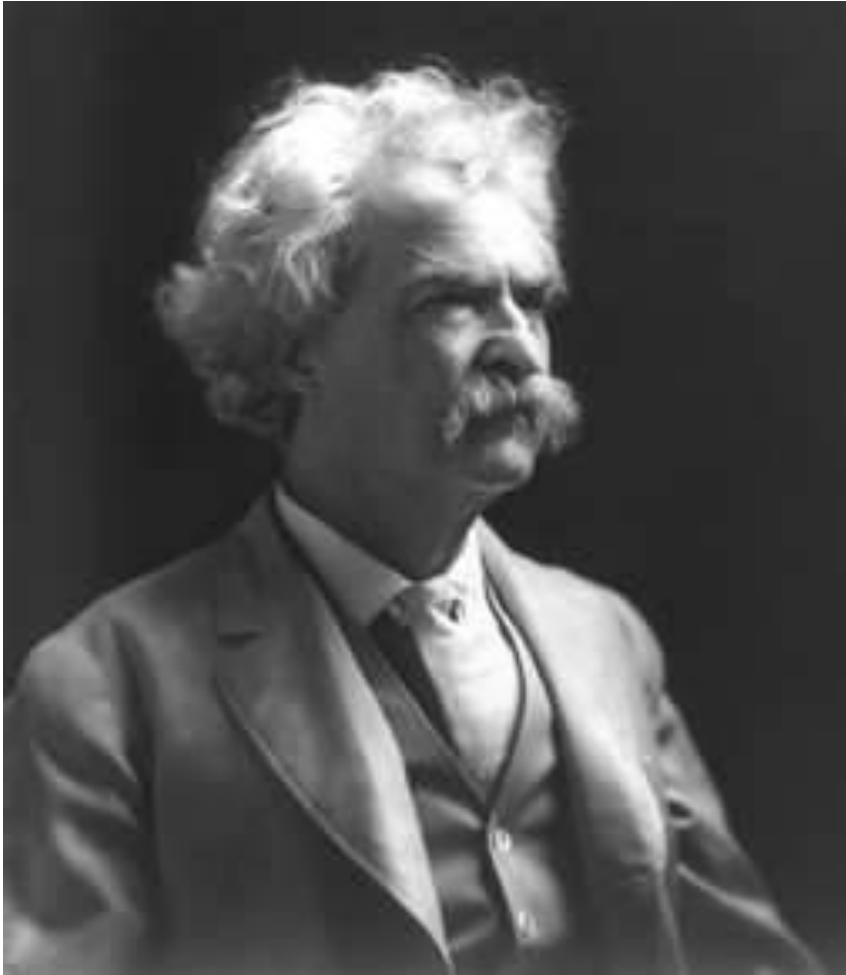
Source :Sackett, D (1996) “*Evidence-based Medicine - What it is and what it isn't.*” BMJ 1996; 312:71-72.

<http://www.bmj.com/cgi/content/full/312/7023/71>

Evidence-Based Practice Considerations

- The same facts can lead to different conclusions
- Bias must be considered
- Sample size must be considered
- Does the evidence answer the research question?
- Is the study replicable?
- Have other similar studies arrived at the same conclusion?
- Is the evidence strong enough to justify a change in practice?

Mark Twain



- “There are three kinds of lies...lies, damned lies, and statistics”

Choose Your Approach

Here are the facts. What conclusions can we draw?

Here's the conclusion. What facts can find to support it?



Classic EMS Excuses

- “That’s the way we’ve always done it”
- “It won’t change what I do in the field”
- “My system doesn’t need that”
- “It’s too expensive”
- “It will require too much training time”
- “We will lose personnel if they have to do that”
- “Do you really want the medics/EMT’s in our area to be responsible for that?”

Getting Past Square One

"You cannot arrive at excellence by passively accepting mediocrity. The status quo is your enemy and must be constantly challenged."

- G. J. 2012

TRAUMA CONTROVERSIES

The Use of Hyperventilation in Closed Head Trauma



What We Do

- *Despite evidence and protocol, EMS personnel cling to old thinking and are often observed to be routinely hyperventilating head trauma patients—often to excess.*



What The Evidence Says

- “In the setting of acute brainstem herniation in traumatic brain injury (TBI), the use of hyperventilation to reduce intracranial pressure may be life-saving. However, undue use of hyperventilation is thought to increase the incidence of secondary brain injury through direct reduction of cerebral blood flow.”
- “Patients with normal CO₂ on presenting arterial blood gas testing had in-hospital mortality of 15%, significantly improved over patients presenting with low CO₂ (in-hospital mortality 77%) or high CO₂ (in-hospital mortality 61%). Although there are many reports of the negative impact of prophylactic hyperventilation following severe traumatic brain injury, this modality is frequently utilized in the prehospital setting. Our results suggest that abnormal Pco₂ on presentation after severe head trauma is correlated with increased in-hospital mortality. We advocate normoventilation in the prehospital setting.”
- Source: Dumont, T, Vioni AJ, Rughani AI, Tranmer BI, Crookes B (2010), “Inappropriate prehospital ventilation in severe traumatic brain injury increases in-hospital mortality”. J Neurotrauma. 2010 Jul;27(7):1233-41.

What The Evidence Says

Summary of findings of multiple studies:

- Hyperventilation reduces cerebral blood flow by promoting vasoconstriction that can lead to secondary brain injury.
- Hyperventilation in head injury should be avoided unless specific criteria are met.
- Secondary brain injury from reduced cerebral perfusion is a leading cause of mortality in TBI (traumatic brain injury) patients.

What We Should Be Doing

- ***“Patients should be maintained with normal breathing rates (ETCO₂ 35-40 mmHg), and hyperventilation (ETCO₂ < 35 mmHg) should be avoided unless the patient shows signs of cerebral herniation.”***

Source: Brain Trauma Foundation (2007) “Guidelines for Prehospital Management of Severe Traumatic Brain Injury, 2nd Edition”, published as a supplement to Prehospital Emergency Care, Vol12, No.1, Jan-Mar 2007, available at <http://tbguidelines.org/glHome.aspx>



What We Should Be Doing

- “If head injury is suspected, the Glasgow Coma Scale (GCS) score is less than 8, **AND** active seizures or one or more of the following signs of brain herniation are present, hyperventilate the patient with high concentration oxygen at a rate of **20 breaths/min.** :
 - Fixed or asymmetric pupils.
 - Abnormal flexion or abnormal extension (neurological posturing).
 - Hypertension and bradycardia (Cushing’s reflex).
 - Intermittent apnea (periodic breathing).
 - Further decrease in GCS score of 2 or more points (neurological deterioration).

Do not hyperventilate unless the above criteria are met!”
- *Source: NYS DOH Statewide Basic Life Support Adult and Pediatric Treatment Protocols 2008*

TRAUMA CONTROVERSIES

Bleeding Control: Tourniquets and Hemostatic Dressings



What We Do

- For decades, EMS personnel were taught that “tourniquets are a last resort” and that they should only be used when the choice is “lose the limb or save the life”. Most EMS classes, if they even covered the subject, taught the technique of cravats and a crude improvised windlass, to be used AFTER pressure dressings failed to stop bleeding..using examples such as “if you are out in the woods alone....”
- By following that notion, we ignored the fact that the military and surgical community *routinely* used tourniquets to control bleeding with great success-and we probably let some of our patients bleed to death for no reason!

What the Evidence Says

- “The 2004 edition of the (US Army) *Emergency War Surgery Manual* now states, “Use a tourniquet early, rather than allow ongoing blood loss. (Tourniquet use) ... does not require constant attention; allows first responders to care for others, extends resources... *Application for more than two hours may increase limb loss. Don't avoid a tourniquet in order to save a limb, and then lose a life! Use of the tourniquet does not always lead to limb loss.”*

Source: <http://www.jems.com/article/patient-care/civilian-ems-should-consider-tourniquets>

What the Evidence Says

- “A series of studies have looked at the efficacy of prehospital tourniquets and their safety. The conclusions are overwhelmingly in favor of applying tourniquets to control severe extremity hemorrhage. *In addition, they highlight the near-total absence of significant complications attributable solely to the use of tourniquets.*”
- Although the studies continue to verify a lack of extremity injury attributable to the use of tourniquets, *the ongoing improvement and reduction in transport times to tertiary levels of care further reduces those concerns.*”

Source: Risk, G, Augustine, J (2012) "Civilian EMS Should Consider Tourniquets", JEMS, March 2012, available at <http://www.jems.com/article/patient-care/civilian-ems-should-consider-tourniquets>

What Protocol Says

I. Assure that the patient's airway is open and that breathing and circulation are adequate. Apply oxygen if needed.

II. Control bleeding by:

A. Immediately applying pressure directly on the wound with a sterile dressing.

NOTE: If available and bleeding is severe, a hemostatic gauze dressing should be applied directly to the bleeding site simultaneously with direct pressure.

B. If bleeding soaks through the dressing, apply additional dressings while continuing direct pressure. Do not remove dressings from the injured site!

C. Cover the dressed site with a pressure bandage.

III. If severe bleeding persists from a limb, apply a tourniquet just proximal to the bleeding site. If severe bleeding still persists, a second tourniquet may be applied proximal to the first tourniquet. Record time tourniquet was secured and document near the tourniquet site.

IV. If severe bleeding persists from the trunk, neck, head or other location where a tourniquet cannot be used, hemostatic gauze dressings should be used.

V. Assess for hypoperfusion. If hypoperfusion is present, refer immediately to the hypoperfusion protocol!

VI. Transport keeping the patient warm.

VII. Ongoing assessment. Obtain and record the patient's vital signs, repeat enroute as often as the situation indicates.

VIII. Record all patient care information, including the patient's medical history and all treatment provided, on a Prehospital Care Report (PCR).

Source: NYS EMT-B Basic Life Support Protocols, updated 7/1/11

What We Should Be Doing (or at least thinking about!)

- If the overwhelming evidence indicates that tourniquets are effective, AND that with short transport times, DO NOT result in limb loss....
- Then WHY, when faced with exsanguinating limb bleeding, are tourniquets a THIRD option (after pressure, hemostatic dressings, pressure bandage) and not a **FIRST** option?

...And About Those Hemostatic Dressings

- Does your agency have them?
- Why not?
- Why do we allow protocols that have loopholes like “if available”?
- Shouldn't there be ONE standard of care?
- Are you still clinging to old thinking that prehospital personnel should never put any substance (other than a dry dressing) into/over a wound?

What The Evidence Says

- “In the U.S., however, where many trauma fatalities are also the direct result of exsanguination, there has been little change in hemorrhage control protocols that most often include only direct pressure and standard dressings. The success of these new hemostatic dressings on the battlefield should prompt all EMS agencies to consider their use in civilian practice.”

Source: Zeller, J, Fox, A, Pryor, J (2008) "Use of Hemostatic Dressings in Civilian EMS", JEMS, March 2008, available at <http://www.jems.com/article/training/use-hemostatic-dressings-civil>

What The Evidence Says

- Battlefield use of hemostatic dressings dates back more than a decade
- There are multiple types of dressings, and each have pros and cons, and new products are being developed
- PHTLS Recommendation: *Topical hemostatic agents may be used to control hemorrhage occurring in sites not amenable to tourniquet placement and which cannot be controlled by direct pressure alone.*

Source: Stuke, L (2011) "Prehospital Topical Hemostatic Agents: A Review of the Current Literature", PHTLS Executive Committee, NAEMT, available at <http://www.naemt.org/Libraries/Trauma%20Resources/Prehospital%20Tobpical%20Hemostatic%20Agents.sflb>

What We Should Be Doing (or at least advocating for!)

- Get rid of protocol loopholes-one standard for all!
- Hemostatic dressings should be required for all EMS agencies



Trauma Controversies

The Use of IV Solutions in Hemorrhagic Shock



What We Do

- Although EMS systems have emphasized short scene times and establishing IV's enroute for trauma victims, there remains a notion that continuous infusion of IV solutions are necessary to maintain blood pressure and save lives.



What The Evidence Says

- Systolic blood pressure may be one of the LEAST reliable indicators of shock or as an endpoint in resuscitation
- Excessive fluid resuscitation (over 2 liters of crystalloid) results in hemodilution, washing out platelets and RBC's
- Sudden rise in B/P without effective hemorrhage control can "pop" forming clots at systolic pressures of 80 mm/hg
- Excessive fluid resuscitation can activate chemical processes that produce coagulopathies.
- The presence of a peripheral pulse may be a more reliable indicator to guide fluid therapy than attempting to raise B/P to pre-trauma levels

What The Evidence Says

- “Aggressive cyclic hyper resuscitation using crystalloid fluids also has other hazardous and reproducible physiological consequences.
- At approximately 750ml of administered crystalloid solution, cytokines are activated and an iatrogenic dilutional coagulopathy occurs.
- Platelets, prothrombin time, PTT, and (other measurable clotting factors) evaluations demonstrate statistically abnormal difference compared to normal values in patients who have post traumatic hypotension and have received no or limited fluid resuscitation.
- The cyclic hyper resuscitated patient arrives in the operating room from the ambulance dock or the emergency center, already with a preventable coagulopathy even before the first incision
- AND, those who caused the coagulopathy were never aware that they presented the surgeon with a situation that made optimal therapy much more difficult. “

Source: Mattox, K (2003) "Permissive Hypotension" trauma.org 8:1, January 2003, <http://www.trauma.org/archive/resus/permhyppoeditorial.html>

What We Should Be Doing

- Accept MUCH lower B/P's in the field (80 mm/hg systolic)
- Emphasize rapid transport to trauma centers where BLOOD PRODUCTS can be given and surgical control of hemorrhage can be accomplished
- Don't spend excess time on the scene waiting for ALS
- Stop delivering patients with "Hawaiian Punch" in their veins who are coagulopathic, hypoxic, and exsanguinating.
- Heed Mattox advice:

"The final target for a prehospital or EC measured BP will be that ..greater than 80 SYSTOLIC will be the level that the QA moral police will cite that those of you who believe in two large bore IVs, Rapid infusors, interosseous and sternal infusors, the 3 to 1 rule, and cyclic hyper resuscitation as causing unnecessary complications, deaths, and costs.

-Mattox, K (2002), Trauma.org, trauma list, August 30, 2002

TRAUMA CONTROVERSIES

BACKBOARDS



What We Do

- The general belief among EMS providers is that backboards and collars “immobilize the spine” and act as a “spinal splint”, preventing movement and secondary trauma.
- EMS providers practice “CYA” and immobilize anyone with a mechanism of injury that even vaguely suggests spinal injury
- ***BUT.....***

What We Do

- EMS providers have also been known to “stretch” spinal immobilization protocols.
- For example....with the advent of “rapid extrication” techniques (designed for the most critical patients) many EMS providers probably cant answer the question...

What's This?

(and when was the last time you used it?)



What We Do

- EMS is positively schizoid about spinal immobilization
- We “rapidly extricate” everyone, but also rely on “standing takedowns” of people with no symptoms....
-and we go absolutely NUTS when ED staff clear the spine and remove backboards without X-rays

What The Evidence Says

- Collars and boards do not “immobilize”, they restrict motion
- Backboards are valuable transport/stabilization devices, but should be removed as soon as possible in the ED
- There is scant evidence that patients with stable spinal fractures without evidence of cord injury (ie: neurological deficits) will develop secondary spinal trauma
- Immobilization devices can cause a series of complications, even when properly used

What The Evidence Says

- “Respiratory compromise due to the strapping techniques used and pressure complications from rigid immobilization have been reported. Head and back pain is a nearly universal complication of prolonged rigid spinal immobilization and can alter Emergency department presentation and evaluation, necessitating radiographs that might have been avoided by omitting spinal immobilization in asymptomatic patients”

Source: Sen, A (2005) "Spinal Immobilisation in Prehospital Trauma Patient" Journal of Emergency primary Health Care, 2005; Volume 3 : Issue 3

- “The spine board should be removed as soon as possible once the patient is on a firm trolley. Prolonged use of spine boards can rapidly lead to pressure injuries.”

Source: Brohi, K (2002) "Initial Assessment of Spinal Injury", Trauma.org, April 1. 2002, <http://www.trauma.org/index.php/main/article/380/>

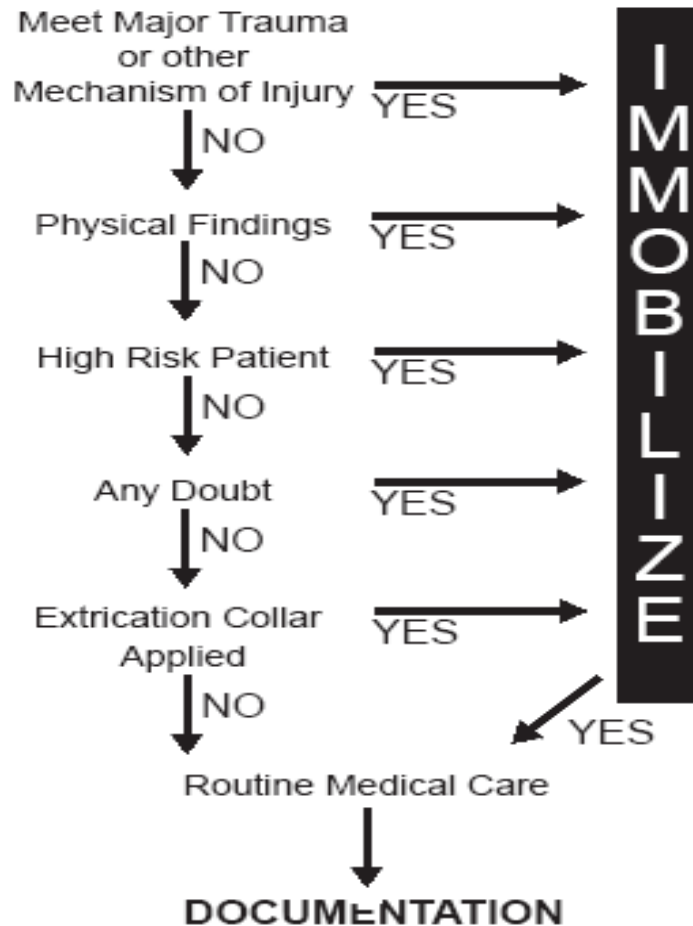
What The Evidence Says

Other relevant studies:

- [Hoffman JR, Wolfson AB, Todd K, Mower WR. Selective cervical spine radiography in blunt trauma: methodology of the National Emergency X-Radiography Utilization Study \(NEXUS\). Ann Emerg Med. 1998 Oct;32\(4\):461-9. PubMed PMID: 9774931.](#)
- [Hoffman JR, Mower WR, Wolfson AB, Todd KH, Zucker MI. Validity of a set of clinical criteria to rule out injury to the cervical spine in patients with blunt trauma. National Emergency X-Radiography Utilization Study Group. N Engl J Med. 2000 Jul 13;343\(2\):94-9. Erratum in: N Engl J Med 2001 Feb 8;344\(6\):464. PubMed PMID: 10891516.](#)
- [Stiell IG, Clement CM, McKnight RD, Brison R, Schull MJ, Rowe BH, Worthington JR, Eisenhauer MA, Cass D, Greenberg G, MacPhail I, Dreyer J, Lee JS, Bandiera G, Reardon M, Holroyd B, Lesiuk H, Wells GA. The Canadian C-spine rule versus the NEXUS low-risk criteria in patients with trauma. N Engl J Med. 2003 Dec 25;349\(26\):2510-8. PubMed PMID: 14695411.](#)

ALL recommend a more selective approach to spinal immobilization as a way of reducing complications and preventing unnecessary x rays

What Protocol Says



What We Should Be Doing (or at least be more aware of!)

- **The NYS BLS protocol for selective spinal immobilization provides an excellent guideline and builds on previous research – follow it !**
- **Stop bending the rules – do it right or don't do it at all (ie: collars only, misuse of rapid extrication, sloppy immobilization on longboards)!**
- **Understand that immobilization techniques are not without complication-watch for them!**
- **Stop freaking out when ED's (correctly) take people off boards or clear cervical spines without x rays.**

TRAUMA CONTROVERSIES

Summary and Some Final Thoughts



Summary

- EMS practice changes rapidly, but systems are often slow to catch up
- EMS personnel cling to old thinking for a variety of reasons
- Refreshers do not effectively integrate new material or challenge providers to move beyond their comfort zone (yes, that's a whole other topic!)
- “Lowest common denominator” protocols inhibit change
- Each EMS provider has an *individual* responsibility to keep up on research and advocate for change (don't wait for it to come from above!)

Uncomfortable? Offended? Thinking? Questioning?



- **GOOD! *CHANGE WILL FOLLOW!***

Interested in Trauma Care?

<http://www.nyats.org/>



THANK YOU!

Hope you enjoyed the ride!