Track: EMS

**Presentation Title: EMS Trauma Update, Issues and Evidence**

Date: Sunday, May 27, 2018

Time: 15:00 - 15:15

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“In the nineteenth century health was transformed by clear, clean water. In the twenty-first century, health will be transformed by clean clear knowledge”

Muir Gray, Director UK NHS National Knowledge Service & NHS Chief Knowledge Officer
EMS Trauma Update: Issues and Evidence

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Faculty/Presenter Disclosure

Faculty: John M Tallon

Relationships with financial sponsors: NONE
ABOUT BCEHS

4600 staff
(4100 paramedics/dispatchers)

4.75 M pop

Provincial service in scope

500,000+ 911 calls in 2016

6.8% increase in annual call volume

7000 air ambulance events

73,000 patient transfers
Objectives:

• Review EMS/Trauma evidence, updates, changes and challenges:
  
  • Trauma systems
  • EMS airway management in trauma
  • Surgical airway options for EMS
  • Traumatic cardiac arrest and EMS
  • Tension pneumothorax
  • Hemostatic agents, dressings and interventions
  • TXA in bleeding/trauma
  • TXA in traumatic brain injury(?)
  • Helicopter utilization in trauma/EMS
  • Optimal EMS analgesia in trauma (and options)
  • ALS versus BLS in trauma systems
NOT Objectives:

• Talk about Trump
• Talk about collusion thereof
• BC fine wines (currently not available in Alberta)
• Gasoline (currently not affordable in Vancouver/lower mainland BC)
• US measurement of ICP via optic nerve sheath in head injury
• Roadside EMS thoracotomy for blunt traumatic arrest
• REBOA in EMS
• ECMO and EMS trauma resuscitation
What’s New in EMS Trauma Care? Why is Trauma Care Important?
TRAUMA and EMS Professionals: Why?

• Trauma is common
• Trauma is expensive
• Trauma is devastating to individuals, families, communities
• Trauma care is challenging
• Trauma is 24/7 disease
Trauma/Injury

- Large public health issue
- More PYLL than stroke, MI and cancer
- Number one killer of Canadians under 44 years
- For Canadians aged 45 - 64, injuries are the third leading cause of death.
- Growing international health issue
- EMS plays a key role in tertiary prevention

www.parachutecanada.org
EMS and Trauma Systems
EMS and Trauma Systems: Essential

Access to trauma systems in Canada, Hameed SM
J Trauma 2010

• Most Canadians (77.5%) reside within 1-hour road travel catchments of Level I or Level II centers. However, marked geographic disparities in access persist.

• Of the 22.5% of Canadians who live more than an hour away from a Level I or Level II trauma centers, all are in rural and remote regions.

• EMS defines entry into the health care system for trauma patients
FIGURE 2. Guidelines for field triage of injured patients — United States, 2011

Measure vital signs and level of consciousness

**Step One**
- Glasgow Coma Scale
- Systolic Blood Pressure (measuring)
- Respiratory rate
- c13
- <90 mmHg
- <10 breaths per minute* (10 in infant aged <1 year) or need for ventilatory support

**Assess anatomy of injury**

**Step Two**
- All penetrating injuries to head, neck, torso and extremities proximal to elbow or knee
- Chest wall instability or deformity (e.g., flail chest)
- Two or more proximal long bone fractures
- Crushed, dislocated, amputated, or palpable extremity
- Amputation proximal to wrist or ankle
- Pelvic fractures
- Open or depressed skull fracture
- Penetrating

**Assess mechanism of injury and evidence of hyperevacy impact**

**Step Three**
- Falls
  - Adults: >20 feet (approximately equal to 10 feet)
  - Children: >10 feet or two or three times the height of the child
  - High-risk home
  - Intoxication,** including blood >12 inches occupant site, >18 inches any site
  - Ejection, fractured or complete from automobile
  - Death in same passenger compartment
  - Vehicle tipover, data consistent with a high risk of injury
  - Auto vs. pedestrian/obstacle thrown, run over, or with significant (>20 mph) impact**
  - Motorcycle crash >20 mph

**Assess special patient or system considerations**

**Step Four**
- Older adults**
  - Risk of injury/death increases after age 65 years
  - SAP >150 might represent shock after age 60 years
  - Low-impact mechanisms (e.g., ground level falls) might result in severe injury
- Hypoxia
- Should be triaged preferentially to pedestrian capable trauma center
- Anticoagulants & bleeding disorders
- Patients with head injury are at high risk for rapid deterioration
- Burns
  - Without other trauma mechanisms: triage to burn facility**
  - With trauma mechanisms, triage to trauma center**
- Pregnancy >20 weeks
- EMS provider judgment

Transport to a trauma center, or hospital capable of timely and thorough evaluation and initial management of potentially serious injuries. Consider consultation with medical control.

**Transport according to protocol**

When in doubt, transport to a trauma center

See Figure 2 footnotes on the next page.
EMS, Trauma and Airway Management
Prehospital Cochrane Corner

Cochrane Systematic Reviews
This Prehospital Cochrane Corner is a collaborative effort between the Cochrane Canada and the Dal Division of EMS. The staff of the CCC has searched the Cochrane Library for reviews that are pertinent to prehospital paramedic care.

Are you looking for reliable research information? Do you want to keep improving your practice? Cochrane reviews can help you take an evidence-based approach and keep you informed about what works and what doesn’t work.

Why use Cochrane reviews?
- They save you time by summarizing the evidence on the effectiveness of treatments and interventions
- Cochrane systematic reviews are produced to the highest methodological standard
- Systematic reviews are more reliable (less biased) than the results of a single study
- An ‘implications for practice’ section provides quick information for practice
- Cochrane review authors are independent and must declare conflict of interests
- Reviews are updated on a regular basis

What is The Cochrane Collaboration?
The Cochrane Collaboration is an international, non-profit organization made up of thousands of volunteer researchers, health professionals and patients in over 100 countries. Cochrane produces and disseminates systematic reviews on the effectiveness of health care interventions.

The Collaboration is organized into Cochrane Groups - which are focused on particular areas of health care (such as the Acute Respiratory Infections group, or Dementia and Cognitive Impairment group), and Cochrane Fields - which focus on areas of interest that overlap several groups (such as the Prehospital and Emergency Care field). Cochrane Centers - such as the CCC, help to coordinate volunteers, offer training, and promote the Cochrane Collaboration.

The key product of Cochrane is The Cochrane Library, with new and updated reviews being published daily. It contains Cochrane reviews, as well as databases of trials, health technology assessments, and economic and methodological studies. Take the online tutorials or view Cochrane Special Collections, review podcasts, see The Journal Club at www.thecochranelibrary.com and Cochrane Summaries at www.summaries.cochrane.org.

The Canadian Cochrane Centre www.thecochranelibrary.com also has resources such as Demystifying Cochrane, Frequently Asked Questions, webinars (live and archived), workshops, events and newsletters at sign up for Cochrane.

Contact Us
EMS Airway Management in Trauma: Issues in Literature

- Observational studies
- Single EMS systems
- The mandate of procedural success versus patient oriented outcomes
- Rural versus urban issues including distance, time and progression of pathology
- CCP versus ACP versus MD
- European model versus North American EMS model
- RSI versus “other” airway’
- Training of paramedic/airway education and skills maintenance
- Underlying pathology i.e. HI versus airway injury versus other
Outcomes in Seriously Head-Injured Patients Undergoing Pre-Hospital Tracheal Intubation vs. Emergency Department Tracheal Intubation

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Outcomes in Seriously Head-Injured Patients Undergoing Pre-Hospital Tracheal Intubation vs. Emergency Department Tracheal Intubation.

**Background:** The optimal treatment of major head injuries in the resuscitative phase of care post-injury has yet to be determined. This study measured the effect on mortality of pre-hospital intubation (PHI) vs. emergency department intubation (EDI) of patients suffering serious head injury.

**Methods:** In the single emergency medical services system for this Canadian province, we used a population-based trauma database, conventional logistic regression (with and without the use of a propensity score to control for selection effect bias) to evaluate the effect of PHI vs. EDI on in-hospital mortality. Inclusion criteria were age ≥ 16 years, serious head injury (Abbreviated Injury Score ≥ 3, non-penetrating trauma) and resuscitative intubation (PHI or EDI).

**Results:** Over 5 years, 283 patients (2000-2005) met inclusion criteria. Conventional unconditional logistic regression modelled on mortality with "PHI vs. EDI" as the intervention of interest showed an odds ratio of 2.015 (95% CI 1.062-3.825) for improved survival if these patients were intubated in the emergency department rather than in the pre-hospital phase of care. A propensity score adjustment demonstrated a similar but more conservative point estimate (OR 1.727, 95% CI: 0.993-3.004).

**Conclusions:** This observational study demonstrated a survival advantage with EDI (versus PHI) in seriously head-injured patients in a mature, province-wide emergency medical services system.

Tallon JM et al 2013
Is this a successful airway?

Davis et al, A Follow up Analysis of Factors Associated with Head Injury Mortality After Paramedic Rapid Sequence Intubation. J Trauma. 2005;59:484-488

PRESS

SOFT

HYPERVERVENTILATION KILLS
In trauma, the current evidence base provides no imperative to extend the practice of prehospital intubation in urban systems.

This review found no difference between endotracheal intubation and other airway securing strategies for reducing deaths after acute illness or injury; however, better studies are needed.
A systematic review and meta-analysis comparing mortality in pre-hospital tracheal intubation to emergency department intubation in trauma patients.

• A systematic literature search was conducted to identify interventional and observational studies where the mortality rates of adult trauma patients undergoing pre-hospital endotracheal intubation were compared to those undergoing emergency department intubation.

• Conclusion: This systematic review consistently shows higher mortality rates when patients undergoing PHI are compared to patients intubated in the ED.

Tracheal Intubation

• If you are going to do it....

• Use a Bougie
Effect of Use of a Bougie vs Endotracheal Tube and Stylet on First-Attempt Intubation Success Among Patients With Difficult Airways Undergoing Emergency Intubation A Randomized Clinical Trial

A Randomized Clinical Trial

Does a bougie facilitate higher first-attempt intubation success than an endotracheal tube + stylet?

https://jamanetwork.com/journals/jama/fullarticle/2681717 May 16, 2018
Surgical Airway in EMS

- Classic: Melker kit
- Recommended: Bougie Cricothyrotomy technique/FONA
- FONA kit contains: #10 scalpel, #6 ETT, Bougie, 10 ml Syringe and instruction checklist/landmarks reminder

SURGICAL CRICOThYROTOMY - FONA

When do I use it?

- ≥ 8 y/o or signs of puberty
- Can’t Oxygenate
- Can’t Ventilate
- Rescue Airway NOT Effective

What equipment do I need?
- #10 Scalpel
- #6 ETT
- Bougie
- 10 mL syringe

Perform Surgical Cricothyrotomy

What are some key landmarks?

- Thyroid Cartilage
- CricoThyroid Membrane
- Cricoid Cartilage

Need support?

Please contact Learning@bcehs.ca or your Regional Advanced Practice Educator

How do I use it?

1. Landmark
2. Make incision
3. Place finger
4. Place bougie
5. Pass ETT
6. Secure and Confirm

Personal Protection

Adapt PPE based on your risk assessment, patient’s condition e.g. infectious diseases.
Best practice: full face shield, gloves, N95

What can make it difficult?

- Distortion: Trauma, expanding hematoma, infection or other pathology
- Access: Obesity, extreme neck flexion (i.e. ankylosing spondylitis)
- Radiation: Therapy in area
- Tumors: Around cricothyroid membrane

Exp 01/2021

BCEHS Medical Programs & Learning
Last Updated: March 2018
Helicopter versus Ground ambulance in Major Trauma
COCHRANE SYSTEMATIC REVIEW: Helicopter emergency medical services for adults with major trauma

Implications for practice: Based on the current evidence, the added benefits of HEMS compared with GEMS are unclear.

Review Overview: Due to the methodological weakness of the available literature, and the considerable heterogeneity of effects and study methodologies, we could not determine an accurate composite estimate of the benefit of HEMS. Although some of the 19 multivariate regression studies indicated improved survival associated with HEMS, others did not. This was also the case for the TRISS-based studies. All were subject to a low quality of evidence as assessed by the GRADE Working Group criteria due to their nonrandomized design. The question of which elements of HEMS may be beneficial has not been fully answered. The results from this review provide motivation for future work in this area. This includes an ongoing need for diligent reporting of research methods, which is imperative for transparency and to maximize the potential utility of results. Large, multicenter studies are warranted as these will help produce more robust estimates of treatment effects. Future work in this area should also examine the costs and safety of HEMS, since multiple contextual determinants must be considered when evaluating the effects of HEMS for adults with major trauma.

Helicopters and Outcomes in Trauma

• Although helicopters are presently an integral part of trauma systems in most developed nations, previous reviews and studies to date have raised questions about which groups of traumatically injured people derive the greatest benefit.

• To determine if helicopter emergency medical services (HEMS) transport, compared with ground emergency medical services (GEMS) transport, is associated with improved morbidity and mortality for adults with major trauma.

• The question of which elements of HEMS may be beneficial has not been fully answered.
ALS versus BLS for EMS Trauma Care
OPALS: Major Trauma

The OPALS Major Trauma Study: impact of advanced life-support on survival and morbidity

• Ian G. Stiell, et al. CMAJ April 22, 2008 178 (9) 1141-1152;

• The implementation of full prehospital advanced life-support by trained paramedics was not associated with lower mortality rates relative to basic life-support measures for patients with major trauma.
The Cochrane Library

**Advanced training in trauma life support for ambulance crews**

**Background**
There is an increasing global burden of injury especially in low- and middle-income countries (LMICs). To address this, models of trauma care initially developed in high income countries are being adopted in LMIC settings. In particular, ambulance crews with advanced life support (ALS) training are being promoted in LMICs as a strategy for improving outcomes for victims of trauma. However, there is controversy as to the effectiveness of this health service intervention and the evidence has yet to be rigorously appraised.

**Objectives**
To quantify the impact of ALS-trained ambulance crews versus crews without ALS training on reducing mortality and morbidity in trauma patients.

Main results

None demonstrated evidence to support ALS training for pre-hospital personnel. In the uncontrolled before-and-after study, 'a priori' sub-group analysis showed an increase in mortality among patients who had a Glasgow Coma Scale score of less than nine and received care from ALS trained ambulance crews. Additionally, when the pre-hospital trauma score was taken into account in logistic regression analysis, mortality in the patients receiving care from ALS trained crews increased significantly.

Authors' conclusions
At this time, the evidence indicates that there is no benefit of advanced life support training for ambulance crews on patient outcomes.

This review of trials found there is no evidence to suggest that ALS training for ambulance personnel improves the outcomes for injured people.

Outcomes of Basic versus Advanced Life Support for Out-of-Hospital Medical Emergencies


**Patients:** 20% random sample of Medicare beneficiaries from nonrural counties between 2006 and 2011 with **major trauma**, stroke, acute myocardial infarction (AMI), or respiratory failure.

In propensity score analyses, survival to 90 days among patients with **trauma**, stroke, and respiratory failure was higher with ALS than BLS (6.1 percentage points [95% CI, 5.4 to 6.8 percentage points] for trauma;

**Conclusion:** Advanced life support is associated with substantially higher mortality for several acute medical emergencies (**trauma**) than BLS.
Trauma and Bleeding and EMS
TXA in Trauma and EMS

• **CRASH 2**: imperative to use within three hours of injury
• In most cases (esp rural/remote) EMS is best poised to administer
• **CRASH 3**: results pending, RCT, HI, primary outcome mortality
• **ROC TXA TBI**: study complete, analysis complete, abstract being presented shortly, embargoed results; primary outcome was GOS-E at 6 months
• Mortality was secondary outcome
• Audit your utilization of TXA!
Combat Application Tourniquet (CAT). It is for use by EMR-to-CCP and taught in ITLS
HEMOSTATIC AGENTS AND EMS

- Increasingly, EMS systems across the country are adding topical hemostatic agents to their prehospital treatment of hemorrhage (Kerby & Cusick, 2012).
- Topical hemostatic agents are available as powders, granules or dressings composed of traditional gauze or dressings impregnated with the active agent.
  - Muco-adhesive agents
  - Factor concentrators
  - Pro-coagulant supplements

https://www.itrauma.org/
Tension Pneumothorax and Traumatic Cardiac Arrest: Implications for EMS
Tension Pneumothorax and EMS

• Needle decompression of tension pneumothorax: Population-based epidemiologic approach to adequate needle length in healthy volunteers in Northeast Germany, Hecker, M et al.

• CONCLUSION Based on the population-based epidemiologic data presented in this study, the use of a needle of 7 cm in length is recommended to decompress a tension pneumothorax in the second intercostal space in the midclavicular line, which might successfully decompress more than 90% of the participants in this study.

• **CONCLUSION:** A small change in clinical practice guidelines, supported by an education and audit program, led to a reduction in unrecognised untreated tension pneumothoraces by paramedics without an increase in complications. Paramedics should be aware that a shorter cannula may fail to reach the pleural space and that both sides of the chest may require decompression.
Chest wall thickness and decompression failure: A systematic review and meta-analysis comparing anatomic locations in needle thoracostomy.

- Current Advanced Trauma Life Support guidelines recommend decompression for thoracic tension physiology using a 5-cm angiocatheter at the second intercostal space (ICS) on the midclavicular line (MCL).

- **Conclusion:** Evidence from observational studies suggests that the 4th/5th ICS-AAL has the lowest predicted failure rate of needle decompression in multiple populations.

Injury. 2016 Apr;47(4):797-804
In Summary if you have a cardiac arrest due to trauma in a Canadian EMS system

• “Trauma Cardiac Arrest Bundle of Care”:

• For PCP and above to include:
• No Chest Compressions (in some situations),
• iGel/SGA, bilateral chest decompression (finger or appropriate catheter),
• large bore IV and fluid bolus (max 500 cc)
• T-POD pelvic immobilizer,
• Rapid transport if within a determined transport time (15-20 minutes).
**HOT mnemonic: Traumatic Cardiac Arrest**

- Focus is on rapid treatment of reversible causes: “HOT”
  - Hypovolaemia
  - Oxygenation
  - Tension pneumothorax

- Some still include CPR in algorithm; many would consider CPR futile in this scenario and distracting from primary pathology
Hypovolemia
- Control external hemorrhage
- Pelvic Binder
- Long bone splitting
- Give Blood

Oxygenation
- Airway management

Tension Pneumothorax
- Bilateral decompression
- Chest tubes
- (could add another 'T' for tamponade)
EMS Analgesia in Trauma: the missed intervention
Prehospital analgesia with intra-nasal ketamine: a randomized double-blind pilot study
G. Andolfatto et al

• Intranasal (IN) ketamine has been shown to provide effective analgesia with no deleterious effects on cardiorespiratory function thus may provide rapid, easily-administered and well-tolerated analgesia in EMS patients.

• Patients were randomized to 0.75 mg/kg of IN ketamine or IN saline. All patents received inhaled nitrous oxide.

• Conclusion: The addition of IN ketamine to usual care with nitrous oxide appears to result in a greater proportion of patients reporting a clinically significant reduction in VNRS pain score and improved subjective comfort, with a greater incidence of minor adverse effects.
Other Analgesic Options:

- **PENTHROX®** RECEIVES MARKETING AUTHORIZATION FROM HEALTH CANADA FOR ADULT PATIENTS REQUIRING RELIEF FROM MODERATE TO SEVERE ACUTE PAIN ASSOCIATED WITH TRAUMA OR INTERVENTIONAL MEDICAL PROCEDURES. APRIL 10, 2018

- PENTHROX®, a low dose methoxyflurane, has been granted marketing authorization by Health Canada

- inhaled analgesic that is self-administered and provides rapid, effective pain relief in five minutes

- Continuous inhalation (of 3ml dose) provides analgesic relief for up to 25-30 minutes, or approximately 1 hour when administered intermittently. (3 ml does may be repeated once)
Trauma Distinction: Accreditation Canada

- [https://www.traumacanada.org/accreditation/accreditedverified-hospital/](https://www.traumacanada.org/accreditation/accreditedverified-hospital/)

- Trauma Distinction recognizes trauma systems or networks that demonstrate clinical excellence and an outstanding commitment to leadership in trauma care.

- Developed in a partnership between TAC and Accreditation Canada, the Trauma Distinction program promotes a coordinated system approach to trauma beginning with **pre-hospital care** and continuing through hospital-care and rehabilitation.

- It consists of specialized standards, protocols and performance indicators that support excellence and innovation.
Conclusions

• Trauma is common, devastating to individuals and communities

• EMS plays a key role in obviating the burden of trauma by expert patient resuscitation and entrance further into the health care system in a timely and systematic fashion.

• Correction/control of bleeding, optimization of oxygenation/ventilation and maintenance of reasonable blood pressure combined with timely analgesic interventions, pelvic immobilisation and rapid/safe transfer in a structured, responsive trauma system to appropriate receiving hospital defines a modern effective EMS system
Last Comment!

• Join Trauma Association of Canada!
• https://www.traumacanada.org/
• **2019** - Join us in **Calgary February 28-March 1, 2019** at the downtown Westin Calgary.
**Conference Co-Chairs:** Sherry MacGillivray, Dr Natalie Yanchar & Dr Sandy Widder
**Scientific Program Chair:** Dr Paul Engels
**Abstract Submission Deadline:** November 1, 2018, Abstract submission module will open July 15, 2018.