Hot Topics at NAEMSP

Paul R. Hinchey MD MBA FACEP
Medical Director
Austin-Travis County EMS System
National Association of EMTs
Fair warning to those who like their sacred cows.....
Hypothetical Case:

You have to make a decision about continuing an intervention in your service...
Here is what you know

• Utilization is complex with multiple steps
  – Requires rapid deployment
  – Failure to do it correctly = badness

• Very infrequently used
  – Skills retention issues

• NO clinical benefit
  – May even cause harm
What do you do?
Evidence Based Medicine

• Best guess
  – We don’t always have the science
• Duty to question the effectiveness
• Evaluate the strength of the science
• Change that which does not work
OLD HABITS

DIE HARD
Age of Rapid Change

• We will have to change rapidly or choices will be made for us

• Those changes will not always be easy

• Must base our changes on the science to have credibility in healthcare
Look who’s talkin’ at NAEMSP

- Medication errors
  - Primum non nocere
- Airway management
  - In pediatric patients
  - In cardiac arrest
- Cardiac arrest
  - Work ‘em on the spot...sort of
- Response times
  - Should have gone out with hair bands
- Spinal immobilization
  - Many do not need immobilization
STAY SAFE AND SAY NO TO DRUGS

Medication Errors
Patient Safety in EMS: Strategies to Reduce Medication Errors

Sabina Braithwaite, MD, MPH, FACEP

Medical Director, Wichita-Sedgwick County EMS System

Clinical Associate Professor of Emergency Medicine, Preventive Medicine and Public Health, University of Kansas
Acknowledgement

John D. Hoyle, Jr. MD, FACEP, FAAP

Michigan State University
“Few tools have as great a potential to cause harm as the laryngoscope, the syringe and the ink pen”
High Reliability Organizations

Organizations that function in hazardous, fast-paced, and highly complex technological systems error-free for long periods of time.
Features of HRO

• Preoccupation with failure
• Culture of safety
• Widely distributed sense of responsibility & accountability
• Continuous personnel training
• Redundancy and a variety of checks and counter checks (safety systems)
Systems approach to clinical process improvement

• Magnitude & frequency of medication errors?
• Reporting mechanism?
• Is issue at an individual or system level?
• Need to intervene?
• Ability to modify behavior?
• What tools are needed?
Routine Hospital Drug

– Physician enters order in computer for patient
  • Computer:
    – Checks that entered weight is appropriate for age
    – Calculates dose for weight and checks dose against child’s weight to assure it is correct

– Order goes to pharmacist who checks dose/mixes drug

– Drug is bar-coded with patient’s name, drug dose

– Nurse scans drug & patient’s ID band
  • Scanner confirms right drug and right patient
  • Nurse double checks pt name and drug
EMS Environmental Risks

- Emergency situation
- No written order
- No external crosscheck
- No electronic decision support
- High-risk medications
- Drug shortage issues and substitutions

IOM Testimony to Congress 5-3-2001:
http://www7.nationalacademies.org/ocga/testimony/Patient_Safety_and_Medication_Errors.asp
Drug prehospital

• EMTP determines drug to be given
• EMTP calculates dose
  – With or without calculator?
  – May consult protocol
  – May use drug dosing aid (Broselow tape)
• EMTP draws up dose or grabs preload
• EMTP administers drug

• How many safety checks?
What is most important:
Deliver medication quickly?
Deliver medication correctly?
Med Errors = Process Change

• Requires a change of our culture!
  – All humans make mistakes - treat errors as a system failure, not a failure of the person that made them
  – Errors need to be freely reported, without repercussions so that the system can be corrected
  – Systems need to be designed, specifically for EMS to decrease the incidence of medical errors
  – *Treat every drug dose as if it’s wrong and will kill the patient* (John Nance)
Just Culture

• Separate behaviors from outcomes
  – Response to unsafe acts based on the behavior and the risk it presents, not on the outcome
Whack a Mole

The Price We Pay For Expecting Perfection

David Marx
Just Culture

• Separate behaviors from outcomes
  – Response to unsafe acts based on the behavior and the risk it presents, not on the outcome

• **Console** human error.

• **Coach** at-risk behavior.

• **Punish** reckless behavior.

• ...independent of outcome.
Dosing Decision Support
Medication Administration Cross-Check (MACC): Standardized method for medication administration, every time, every med
• 2 person verbal procedure
• Contains error traps
• Fast, simple
• Only the 2nd provider ‘authorizes’ the med administration
• Barrier to error reaching the patient
• Creates a pause point
Anonymous Reporting

Institute for Safe Medication Practices
A Nonprofit Organization Educating the Healthcare Community and Consumers About Safe Medication Practices

E.V.E.N.T. EMS Voluntary Event Notification Tool
An EMS Culture of Safety Initiative

Welcome!

Welcome to the EMS Voluntary Event Notification Tool (E.V.E.N.T.).

E.V.E.N.T. is a program of the Center for Leadership, Innovation, and Research in EMS (CLIR) with sponsorship provided by the North Central EMS Institute (NCEMS), the National EMS Management Association (NEMSA), the Emergency Medical Services Chiefs of Canada (EMSCC), the National Association of Emergency Medical Technicians (NAEMT) and the National Association of State EMS Officials (NASEMSO).

E.V.E.N.T. is a tool designed to improve the safety, quality, and consistent delivery of Emergency Medical Services (EMS). It collects data submitted anonymously by EMS practitioners. The data collected will be used to develop policies, procedures and training programs to improve the safe delivery of EMS. A similar system used by airline pilots has led to important airline system improvements based upon pilot reported “near miss” situations and errors.

Any individual who encounters or recognizes a situation in which an EMS safety event occurred, or could have occurred, is strongly encouraged to submit a report by completing the appropriate E.V.E.N.T. Notification Tool. The confidentiality and anonymity of this reporting tool is designed to encourage EMS practitioners to readily report EMS safety events without fear of repercussion.

We post all reported patient safety events and aggregate reports to our Google Group. If you would like to be added to the Google Group, send an email to clirems@gmail.com with your name and EMS agency or affiliation. We’ll add you to the group within 2 business days.
Take-Home Points

• Recognize that medication errors are happening, whether reported / recognized or not. Look for ways to determine and address errors that are being made.

• Provide decision support tools and error traps that are immediately available, particularly if meds/concentrations change.

• Promote a culture of reporting and thoughtful analysis of incidents coupled with appropriate changes to address both system and provider level gaps.
Pediatric Airway Management

Your kid is running around the store screaming at the top of his lungs annoying everyone and I’m the asshole for tripping him??

-@courtneyno
Prehospital Pediatric Intubation Revisited

Marianne Gausche-Hill, MD FACEP, FAAP
Professor of Clinical Medicine, David Geffen School of Medicine at UCLA
Vice Chair, Chief of the Division of Pediatric Emergency Medicine,
Director, EMS and Pediatric Emergency Medicine Fellowships
Harbor-UCLA Medical Center
Department of Emergency Medicine
Hot Issues

• Issues with Prehospital Endotracheal Intubation in Children
  – Complex procedure (60 steps? 25-40 + to gain mastery)
  – Skills not maintained over time
  – Potential for fatal consequences (>15% of ETT dislodged)
  – Laryngoscopy needed to remove FBs in the airway
  – ETT’s needed if tracheostomy dislodged?
  – Outcome not improved by incorporation of the skill in paramedic scope of practice
  – Specifically related to trauma – concern for poorer outcomes
Pediatric Airway Management Project

Objective:

- Large controlled clinical trial in two EMS systems designed to compare the survival and neurological outcomes of pediatric patients treated with bag-mask ventilation (BMV) with those of patients treated with BMV followed by endotracheal intubation (ETI).
830 Patients Enrolled

- 420 Patients Enrolled on Even (ETI) Days (51%)
  - 115 (27%) BVM [3 PV*]
  - 128 (30%) BVM After ETI Attempt [0 PV*]
  - 177 (42%) ETI [0 PV*]
  - 4 Patients Lost to Follow Up
  - 416 Patients Available for Outcome Evaluation

- 410 Patients Enrolled on Odd (BVM) Days (49%)
  - 391 (95%) BVM [1 PV*]
  - 9 (2%) BVM After ETI Attempt [9 PV*]
  - 10 (2%) ETI [10 PV*]
  - 6 Patients Lost to Follow Up
  - 404 Patients Available for Outcome Evaluation

*PV= Protocol Violation
Results:

- Of 420 ETI patients:
- 305 attempted intubation (73%)
- 174 successful (57%) and 3 esophageal intubations
Survival:

- BMV 123/404 (30%)
- ET 110/416 (26%)
  $\text{OR}=0.82 \ [0.61-1.11]$
Neurologic outcome:

• 5 level neurologic outcome score
  – Good neurologic outcome = normal or mild disability
  • BVM 92/404 (23%)
  • ETI 85/416 (20%)
  ♦ OR = 0.87 [0.62-1.22]

No Difference
Pulse oximetry on arrival in ED:

• Medians (IQR)
  – BVM  98% (93-100%)
  – ETI  97% (92-100%)

p value = 0.29

No Difference
ETI Complications (n=186):

- Tube size incorrect 44 (24%)
- Main stem intubation 33 (18%)
- Recognized dislodgement 15 (8%)
- Unrecognized dislodgement 12 (6%)
- Esophageal intubation 3 (2%)

All but one of these patients died
Gausche M, et al conclusions…

- Patient survival and neurologic outcome were not affected by intended airway management method.
- For ETI, scene times are significantly longer and mortal complications are high.
- EMS systems should question the use of ETI in the prehospital care of children.
Prehospital Peds ETI

- Cooper A, et al (2001): Queried National Pediatric Trauma Registry for serious head injured patients – prehospital ETI offered *No survival benefit* or improved functional outcome compared to BMV
- Burton JH, et al (2003): Rural EMS providers rarely (1.4-2.7% of providers) attempt ETI; most providers *<5 ETI attempts /yr*
- Erhlich PF, et al (2004): *67% successful* intubation rate; subsequent attempts resulted in more complications
Prehospital ETI

• Denver Metro Airway Group (2009): Prospective data collection 4 months; > 800 patients; small number of children 48% with ETT in correct position

• Ruetzler K, et al (2011): “ETI associated with low success rate 78% dropped to 58% at 3 months since training.”
Cochrane Systematic Review

  - Reviewed 452 studies – only 3 RCTs (2 adults, 1 children)
  - None showed survival advantage for ETI
  - “In trauma and pediatric patients the current evidence base provides no imperative to extend the practice of prehospital intubation in urban systems”
AHA 2010: Prehospital ETI

- LOE 1 study randomized shows no difference in survival or neurological outcome
- Recommendation is that **BMV recommended over ETI** for ventilatory support in out-of-hospital setting
• Paramedic Self-efficacy and Skill Retention in Pediatric Airway Management
  – To determine the effect of pediatric airway management training on paramedic self-efficacy and skill performance and to determine which of several retraining methods is superior
Youngquist, et al...Skills Testing

- Pass rates for BMV and ETI were 66% (139/211) and 42% (88/212), respectively.
- Poor performance with ETI but not BMV was associated with time elapsed since training (p=0.01).

Paramedics retain the skill of BMV longer than ETI.
Self-Efficacy and Skill Performance

<table>
<thead>
<tr>
<th>Training</th>
<th>Self Efficacy</th>
<th>Skill Pass Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>moderate to very comfortable</td>
<td>BVM: 100%</td>
</tr>
<tr>
<td>Training</td>
<td></td>
<td>ET: 100%</td>
</tr>
<tr>
<td>Retraining</td>
<td>moderate to very comfortable</td>
<td>BVM: 66%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ET: 42%</td>
</tr>
</tbody>
</table>

Self-efficacy ratings were not predictive of skill performance.
Youngquist, et al...Conclusions

• There appears to be a gap between the level of self-efficacy and the ability of paramedics to perform pediatric airway management skills
  – If one uses the adult learning principle – “adults know when it is time to relearn skills”
  – Then skill retraining will be sought LONG after skill performance declines to unacceptable levels
Youngquist, et al…Conclusions

• Periodic, mandated/required airway management skill education and testing may be critical to quality pediatric patient care in the out-of-hospital setting.
  – This data suggests that retraining should occur at least every 6 months
Can paramedics get training in airway management on the job?

• Short answer…No

- Estimated - Take 20 years for each paramedic in 11 counties in California to perform BMV once on a child

Pediatric Continuing Education for Prehospital Providers: Is it Time to Mandate Review of Pediatric Knowledge and Skills?

Rate of procedural opportunity is not uniform

• Population of LA and Orange Counties, CA – 12-15 million persons; 25% children
• 830 patients over 2.75 years
• All got BMV
• 114 patients got ETI (14%)
• 2520 paramedics

12% of paramedics get experience in BMV per year;
1.6% of paramedics in ETI

- Pediatric advanced life support care in an urban setting – 50 paramedics in the system
- Boston (pop 590,000) – over 1 year
  - 555 pediatric patients
  - Total Numbers of Procedures by Paramedics:
    - IV 184 (33%)
    - BMV 28 (5%)
    - ET 15 (3%)
    - IO 3 (0.5%)

Number of procedures per medic:

IV cannulation 3.7; BMV, 0.6, ETI 0.3; IO 0.06 per provider per year

• Prospective study of EMS calls for children <16 years over a 6 month period in Ottawa, Canada
  – 1377 Calls; Mean age 8.2 years
  – Procedures performed:
    • Oxygen – 19.8%
    • Meds IV 1.4%
    • BVM 0.3%
    • ETI 0.1%
• The Future?
  – Workforce training and competencies
  – Creative methods to train and maintain skills for prehospital providers – need to be cost – effective
  – Simulation must play a role as experience unavailable – use of extraglottic devices (King/LT will become more frequent – no data in children on outcome)
  – Formal/controlled studies of airway techniques to include meaningful outcomes
Airway Management for Children

• What can we agree on?
  – Assessment for the need to support ventilation and oxygenation
  – Positioning (jaw thrust, towel roll, etc..)
  – Suctioning
  – Nasopharyngeal airway/Oropharyngeal airway
  – Bag-mask ventilation
  – FB management – laryngoscopy and use of pediatric Magill forceps
  – ETI limited use only… may be replaced with LMA/King?
What about intubation in adult cardiac arrest?

(Not really a formal NAEMSP lecture but everybody’s talking about it)
Retrospective analysis of OOHCA

1,294 Cardiac Arrests
- 79% received intubation
- 10% BVM
- 4% Combitube/EOA

After adjusting for age, bystander CPR, witnessed arrest and initial rhythm

OR for BVM vs Advanced airway was 4.5
Prospective nationwide Japanese Study (observational) – Population-based Cohort

- 649,359 prehospital cardiac arrests
- 57% bag valve mask ventilation
- 43% advanced airway (6% ETT, 37% SGA)
- Evaluated which airway “best”
Overall Results:

- 6.5% ROSC
- 4.7% 1 month survival
- 2.2% good neuro outcome
Neurological Survival

ETT  SGA  BVM

JAMA 2013;309:257-266
Summary

• Multivariate analysis with all possible arrest variables shows advanced airway techniques decrease likelihood for a neurologically intact survival

• BVM ventilation appeared more than twice as likely to give favorable neurologic outcomes
Authors Conclusion

• “CPR with prehospital advanced airway management, whether endotracheal intubation or supraglottic airways, was independently associated with a decreased likelihood of favorable neurological outcome compared with conventional bag-valve-mask ventilation among adults with OHCA.”
Conclusion?

• Several studies suggest intubation in adult cardiac arrest was associated with poorer outcomes
• Does not prove causality
• Better approach is to use what is needed
  – Minimal intervention to get job done
• Truth remains to be found
CPR Under the Old Oak Tree: Where Do You Resuscitate YOUR Cardiac Arrest?

Paul R. Hinchey MD, MBA, FACEP
Medical Director
Austin-Travis County EMS
National Association of EMTs
“The Most Powerful Predictor by far of survival to hospital discharge is return of spontaneous circulation in the field”

Kellerman A. Annals Emerg Med 2010;56:358-61
Figure 3. Smoothing spline representing the incremental probability of survival corresponding to a linear increase in chest compression fraction.

Christenson et al. Circulation 2009
ROC: Adjusted Odds Ratio of Survival

Adjusted OR

CPR Fraction

0-20 21-40 41-60 61-80 81-100

Adjusted for: bystander CPR, age, gender, time from 911 call to arrive at scene, chest compression rate, public location

95% CI
0.87, 5.22
1.00, 5.08
1.20, 6.88
1.50, 7.26
Good CPR is important

You can’t do good CPR while moving

Be aggressive in your efforts

Don’t move
Believe in the providers

• They are the best when it comes to understanding and delivering the fundamentals of resuscitation....

• They provide higher quality CPR with fewer interruptions, control ventilations, embrace choreographed team based high performance cardiac arrest management, and can utilize checklists
Person in Position 4 (P4) always just outside the “Triangle” of CPR
1. Team Leader Duties
2. May assist with BIAD preparation and securing if needed

Person in Position 3 (P3) always at patients' 
1. Opens/clears Airway and insert OPA
2. Assembles/apply BVM and ITD
3. Provides 2 hand mask seal
3. Inserts/secsures BIAD (King) & ITD & ETCO₂ after 400 Compressions

Person in Position 1 (P1) always on patients' Right side
1. Initial patient assessment
2. Initiates 100 compressions
3. Ventilates in off cycle
4. BIAD Preparation in off cycle

Person in Position 2 (P2) always on patients' Left side
1. Brings and operates AED
2. Alternates 100 compressions with P1
3. Ventilates in off cycle
4. Turns on AED after 200 Compressions
5. Assist with BIAD Preparation if needed

Advanced Provider in Position 5 (P5) always at an extremity outside the CPR “Triangle” near a lower leg and Operates the Monitor
1. Code Commander
2. Communicates/Interfaces with Team Leader
3. Makes all Patient treatment decisions

Advanced Provider in Position 6 (P6) always at an area outside the CPR “Triangle” near a lower leg and Operates the Monitor
1. Code Commander
2. Communicates/Interfaces with Team Leader
3. Makes all Patient treatment decisions
It makes a difference
Portland paramedics have nearly tripled their success rate in the past year of saving patients who have suffered cardiac arrest, in large part by providing emergency services on the scene and avoiding time-consuming ambulance rides to local hospitals.
Now a case that made us begin to consider a whole new element of OOHCA management....
Case # 2

• 16:48 Arrived to find 39 YOF in CA with FR performing mechanical CPR with King LT
• Hx HTN taking metoprolol
• Per husband pt had been complaining of “indigestion” for hours
  – suddenly complained of shortness of breath and collapsed.
  – Husband provided bystander CPR until FR arrival.
I’ll spare you the details....

- Initial rhythm v-fib
- 3 shocks by FR
- 4 additional by EMS
- 3 epi and Amio
- 17:11 ROSC(23 min)
- Began post resuscitation care
- 2 min later re-arrest

- 2 additional shocks progressing to PEA
- Continued resuscitation with 6 additional epi and bicarb
- 17:51 Transport initiated with mechanical compression device (63 min)
So why did they initiate transport?
“...throughout cardiac arrest patient has intermittent spontaneous respiration, eye opening and movement of arms....”
At the ED....

- Pt remained in PEA but continued to move, open eyes, breathe so...efforts continued
- Cardiologist called and took to cath lab at approximately 19:00 hrs (132 min); found and opened proximal LAD occlusion with good perfusion
- Unable to maintain adequate pressure despite IABP...pt expired.
Was this an inevitable outcome or was the intervention too late and the total ischemic time too long for salvage....
Continuous Mechanical Chest Compressions During Cardiac Arrest to Facilitate Restoration of Coronary Circulation With Percutaneous Coronary Intervention

- 53yom ems witnessed arrest
- Brief ROSC with STEMI
- Taken to lab with prox LAD occlusion at 110 min into arrest
- Revascularized but no pump function confirmed by echo
- Expired

- 53yof with 2 vessel ds with intervention
- V-fib arrest after cath
- Placed compression device and returned to lab at 10 min
- Confirmed poor perfusion additional intervention
- D/C neuro intact

Cardiac arrest in the catheterisation laboratory: A 5-year experience of using mechanical chest compressions to facilitate PCI during prolonged resuscitation efforts

Henrik Wagner\textsuperscript{a}, Christian J. Terkelsen\textsuperscript{b}, Hans Friberg\textsuperscript{c}, Jan Harnek\textsuperscript{a}, Karl Kern\textsuperscript{d}, Jens Flensted Lassen\textsuperscript{b}, Goran K. Olivecrona\textsuperscript{a,*}

- 43 pt (33 STEMI, 7 NSTEMI, 2 elective, 1 PCT)
  - 5 had myocardial rupture - all died
  - 36 treated with PCI
- 11 d/c alive in good neuro condition

Conclusion: MC in cath lab allows PCI despite CA with sustained circulation. It is unlikely any of these pt would have survived without the use of MC during catheterization.
Back to the Drawing Board

• Perhaps staying on scene is not the best approach for ALL cardiac arrests but:
  – Who should we take to the lab?
  – How long should we work them on scene?
  – How do we provide adequate perfusion during transport?

• How do we convince cardiology to take these patients to the cath lab in arrest
This is NOT for EVERY Arrest

- Have limited number of cardiologists willing to go to cath lab
- I believe the current philosophy is right based on NOBODY going to the cath lab but...
- It risks prolonged ischemic times and likely creates self-fulfilling prophecy of poor outcomes when we DO go to the lab
Back to the Drawing Board

- Who should we take to the lab?
- How long should we work them on scene?
- How do we provide adequate perfusion during transport?
Potential Criteria

- Witnessed cardiac arrest
- Bystander CPR
- Mechanical CPR Device

- AND -
Potential Criteria???

• Good story for ischemia prior to collapse?
• Refractory V-fib/Vtach after:
  – 20 minutes-or-
  – Complete dose of antiarrhythmics-or-
  – DSED?
• PEA/Brief ROSC with evidence of STEMI?
Take Away

- Cardiac arrest should STILL be worked where they drop, but...
- The quality of prehospital resuscitation has prompted new questions.
- We need to work with the cardiologists to study which patients would benefit from the lab and develop a process to get them there
Response times
Why ambulance response times?

- Easy to measure
- Easy for public to understand
- Literature says <8 minutes, doesn’t it?
Cardiac Resuscitation in the Community

Importance of Rapid Provision and Implications for Program Planning

Mickey S. Eisenberg, MD, PhD; Lawrence Bergner, MD, MPH; Alfred Hallstrom, PhD

Several time-related variables involving resuscitation from out-of-hospital cardiac arrest are significantly associated with survival from cardiac arrest. The two times were jointly related, and one short time without the other was unlikely to result in survival. If CPR was initiated within four minutes and if definitive care was provided within eight minutes, 43% of patients survived. If either time was exceeded, the chances of survival fell dramatically. The time to initiation of CPR is widespread citizen CPR training. A possible option to improve the time to definitive care is the training of emergency medical technicians in defibrillation.

(JAMA 241:1905-1907, 1979)
At some point 8 minutes to a defibrillator was a meaningful measure for cardiac arrest but...
...that time frame was ONLY described as beneficial for cardiac arrest and... the technology, scope of practice and the science have changed
When you challenge that concept and look at the evidence for the clinical impact of the ambulance/paramedic response time...

there really isn’t any...
Response Time Effectiveness: Comparison of Response Time and Survival in an Urban Emergency Medical Services System

THOMAS H. BLACKWELL, MD, JAY S. KAUFMAN, PhD

LACK OF ASSOCIATION BETWEEN PREHOSPITAL RESPONSE TIMES AND PATIENT OUTCOMES
Thomas H. Blackwell, MD, Jeffrey A. Kline, MD, J. Jeffrey Willis, MD, G. Monroe Hicks

Paramedic Response Time: Does It Affect Patient Survival?

Peter T. Pons, MD, Jason S. Haukoos, MD, MS, Whitney Bludworth, MD, Thomas Cribley, EMT-P, Kathryn A. Pons, RN, Vincent J. Markovchick, MD

EIGHT MINUTES OR LESS: DOES THE AMBULANCE RESPONSE TIME GUIDELINE IMPACT TRAUMA PATIENT OUTCOME?

Peter T. Pons, MD, FACEP, and Vincent J. Markovchick, MD, FACEP

Department of Emergency Medicine and Denver Paramedic Division, Denver Health Medical Center, Denver, Colorado Correspondence Address: Peter T. Pons, MD, 777 Bannock Street, Denver, CO 80204
Lack of Association Between Prehospital Response Times and Patient Outcomes

Thomas H. Blackwell, MD, Jeffrey A. Kline, MD, J. Jeffrey Willis, MD, G. Monroe Hicks

- 373 P1 response > 10:59 vs random historical control < 10:59
- Survival to D/C:
  - 80% (study) vs 82% (cntrl)
- ALS procedures:
  - 47.7% (study) vs 45.4% (cntrl)
- Need to get SOMEONE there < 5 min

Blackwell et al PEC 2009
What’s the harm?

• Illusion of quality
• Unsafe driving practices
• Flawed system design
• Errant unit deployment
• Failure to use metrics that do matter
If we measure the right things we can show real clinical value not only to our citizens and politicians but to our healthcare partners.
<table>
<thead>
<tr>
<th>Clinical Area</th>
<th>Elements in Model</th>
</tr>
</thead>
</table>
| ST-Elevation Myocardial Infarction (STEMI). | Aspirin (ASA), if not allergic  
12-Lead electrocardiograph (ECG) with prearrival activation of interventional cardiology team as indicated  
Direct transport to percutaneous coronary intervention (PCI) capable facility for ECG to PCI time < 90 minutes |
| Pulmonary edema                       | Nitroglycerin (NTG) in absence of contraindications  
Noninvasive Positive Pressure Ventilation (NIPPV) preferred as first-line therapy over endotracheal intubation |
| Asthma                               | Administration of beta-agonist  
Blood glucose measurement  
Benzodiazepine for status epilepticus |
| Trauma                               | Limit non-entrapment time to < 10 minutes  
Direct transport to trauma center for those meeting criteria, particularly those over 65 (with time consistent caveats for air medical transport situations) |
<p>| Cardiac arrest                       | Response interval &lt; 5 minutes for basic CPR and automated external defibrillators (AEDs) |</p>
<table>
<thead>
<tr>
<th>Clinical Area</th>
<th>Elements</th>
<th>NNT</th>
<th>Harm Avoided</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST-Segment Elevation Myocardial Infarction (STEMI)</td>
<td>Aspirin 12-lead electrocardiograph (ECG), direct transport to percutaneous cardiac intervention (PCI) interval from ECG to balloon &lt; 90 minutes&lt;sup&gt;46,47&lt;/sup&gt;</td>
<td>15</td>
<td>Either a stroke, 2nd myocardial infarction, or a death</td>
</tr>
<tr>
<td>Seizure</td>
<td>Administration of benzodiazepine for status epilepticus&lt;sup&gt;66&lt;/sup&gt;</td>
<td>4</td>
<td>Persistent seizure activity</td>
</tr>
<tr>
<td>Pulmonary edema</td>
<td>Noninvasive positive pressure ventilation (NIPPV)&lt;sup&gt;59&lt;/sup&gt;</td>
<td>6</td>
<td>Need for an endotracheal intubation</td>
</tr>
<tr>
<td>Trauma</td>
<td>Patients with an Injury Severity Score (ISS) &gt; 15 to trauma center&lt;sup&gt;72&lt;/sup&gt;</td>
<td>11</td>
<td>1 death</td>
</tr>
<tr>
<td>Trauma</td>
<td>Patients over 65 years of age with ISS &gt; 21 to trauma center&lt;sup&gt;69&lt;/sup&gt;</td>
<td>3</td>
<td>1 death</td>
</tr>
<tr>
<td>Cardiac arrest</td>
<td>Defibrillator to the scene &lt; 5 minutes rather than &lt; 8 minutes&lt;sup&gt;15&lt;/sup&gt;</td>
<td>8</td>
<td>1 death</td>
</tr>
</tbody>
</table>
Response Times

• Not that we shouldn’t measure it just acknowledge that it is a measure of SERVICE

• Can still be used to assess:
  – Need for additional resources
  – Unit positioning
  – Harbinger of increasing volume

• Clinical metrics have more POWER
Spinal Immobilization
Spinal Immobilization

- Has been practiced for over 40 years
- Evidence for benefit is lacking - some suggest it is detrimental
- Truth remains unclear but immobilizing for everything is clearly not appropriate
Spinal Immobilization

Pros
• No additional spinal cord injury...
• We think...
• Maybe

Cons
• Airway compromise and aspiration risk
• Increased respiratory effort
• Increased ICP
• Pain
• Pressure ulcers
46 patients followed for total board time
Avg total BB time 54 min (11m-7h 49m)
Avg EMS BB time 33 min
Avg Hosp BB time 21 min

Conclusion: Further study needed to evaluate strategies to reduce total backboard time
POSITION STATEMENT

EMS Spinal Precautions and the Use of the Long Backboard

National Association of EMS Physicians and American College of Surgeons Committee on Trauma
• Normal GCS (15)
• No spine tenderness or anatomic abnormality
• No neuro findings or complaints
• No distracting injury
• No intoxication
Patients with penetrating trauma to the head, neck, or torso and no evidence of spinal injury should not be immobilized on a backboard.

Spinal precautions with rigid cervical collar and EMS stretcher may be appropriate for:
- Patients who are ambulatory
- Transported for protracted time (inter-facility)
- Patients where BB not otherwise indicated
Biomechanical analysis of spinal immobilisation during prehospital extrication: a proof of concept study

Mark Dixon,¹,² Joseph O’Halloran,³ Niamh M Cummins¹

Conclusions  Conventional extrication techniques record up to four times more cervical spine movement during extrication than controlled self-extrication. This proof of concept study demonstrates the need for further evaluation of current rescue techniques and the requirement to investigate the clinical and operational significance of such movement.

Dixon et al Emerg Med Jrnl; 2013
Take Away

- **Medication errors**
  - Errors are happening even if you don’t look
  - Use systems approach and don’t blame the provider
  - Make a safer system with a process that builds in error traps

- **Airway management**
  - Advanced airways in peds do not convey benefit
  - Airway skills require constant maintenance not met by volume
  - For cardiac arrest the jury is still out-safe bet is to embrace the basics!
Take Away

• Cardiac arrest
  – Work ‘em where they drop
  – It's all about quality CPR don’t do anything to screw that up
  – There is an as yet to be defined population that may undo bullet #1 – IF we can reliably get them to a cath lab

• Response times
  – Are a service metric
  – First unit on scene matters for a small number of events
  – Detracts from what we really do offer clinically
  – Promotes bad behaviors and distracts us from measuring things that matter
Take Away

• Spinal Immobilization
  – True benefit is as yet unknown but does have potential to harm
  – Should be employed selectively to get appropriate risk benefit ratio
Take Away

• Change is the new future of EMS
• What we know, not do, is who we are
• Evidence-based medicine is more than just a catch-phrase
• If they don’t work we need to eat our sacred cows
More on Pit Crew at:
atcomdce.org