Issues in Pre-hospital Care
Staying Alive in the Field?

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A tragic emergency health care intervention outcome
It does happen....

Learning Objectives
1. Define issues, hazards and areas of risk EMS providers and data on occupational injury and fatality risks for EMS providers
2. Describe factors related to hazards and risks during EMS transport and identify potential mechanisms of work related injury to EMS providers
3. List the resources that are available for additional information on EMS transport safety
4. Identify safety standards and guidelines that exist for the EMS environment and update of latest safety developments
5. List strategies to enhance safety and reduce risks to patients, providers and the public and optimizing the safety of their work place

Outline
- Review of EMS provider injury and fatality data
- Identification of work related safety issues, hazards and areas of risk for EMS providers, including transportation, ergonomic, biohazards and violence
- Overview of challenges to safety practice
- Review of safety standards and guidelines that exist for protecting EMS providers in the work place
- Strategies to enhance occupational safety and to reduce risks and hazards for EMS providers
- An update of latest safety developments on the horizon and important new directions in EMS safety

'tNew World' Hazards for EMS...

http://www.objectivesafety.net

So you are EMS personnel...
- What’s going to kill you?
- What’s going to injure you?
EMS Fatalities
- 12.7 fatalities/100,000 EMS workers
- Greater than 2 X the national average (5.0 fatalities/100,000)
- Similar to Police (14.2/100,000) and Fire Fighters (16.5/100,000)

USA EMS
- EMS Systems - >15,000
- Personnel - ~1 million (~30% F/T professional & 70% volunteer)
- Vehicles - ~50,000 (Type I, Type II, Type III, Freightliners, motorcycles)
- Transports - ~50 million (to Emergency Deps ~ 50%, < 1/3 emergent)
- Cost - ~$8 Billion annually
- Safety Oversight - ? Disparate

A devastating tragedy…
- An ETT down the wrong hole may kill your patient and be a terrible burden for the pts family and for the medic involved
- BUT an EMS crash can kill all involved AND wipe out an EMS systems response capacity…..

Some recent adverse outcomes

EMS Safety IS Complex AND Multidisciplinary

Fatalities and funerals

This week….
- An accident ?
- or a predictable and preventable event

Firstly!

A word about occupational transportation fatalities..
EMS Injuries*
- Higher than the injury rate for any private industry published by DOL
- 34.6 injuries/100 full-time workers per year
- 1.5 x that of fire fighters
- 5.8 x that of health services personnel
- 7 x the national average

And the injury events...
- [Chart showing percentage of cases]

News we don’t want to see...
- [Image of a news clip]

EMS Best Practice, Sept 2006
- Guidelines – standards
  - Transport safety
  - Practice protocols
  - Occupational Health and Safety

Goals
- Standards for safety
- Policy based on Science
- Databases to demonstrate outcome

Predictable risks
- More often at intersections, & with another vehicle (p < 0.001)
- Most serious & fatal injuries occurred in rear (OR 2.7 vs front) & to improperly restrained occupants (OR 2.3 vs restrained)
- 92% of fatally injured EMS rear occupants unrestrained
- Serious head injury in 44% of fatal occupant injuries
- 75% of fatal crashes EMS crashes during Emergency Use
- More likely to crash at an intersection with traffic signals (35% vs 16% p<0.001) & more people & injuries/crash than similar sized vehicles

Balance of concerns and risk during transport
- Response and transport time
- Clinical care provision
- Occupant safety/protection
- Public Safety
**Benefit of Safety**

- Any cost of addressing these issues is dwarfed in contrast to the huge burden of not doing so - in financial costs let alone the personal, societal, ethical and litigation costs.

**This is about you and your safety**

- What safety practices do you use??
  - Seat belts ?
  - EVOC training ?
  - Equipment lock down ?
  - Helmets ?
  - “Black Box” technology ?
  - Tiered dispatch ?

**NAEMT July 2006 Position statement**

**Tips for Emergency Vehicle Operations**

**The truck and bus industry is on the right track.... Where is EMS??**

**EMS Transport General Concerns**

- Consequences can be predictable & likely preventable
- Costs of these adverse events are high in loss of life, financial burden and negative impact on delivery of EMS care
- Other high speed vehicles (eg. racing cars) have a different safety paradigm
- Design of interventions to mitigate injury is predicated on a valid testing model
- Complex both engineering and public health issues

**Background: USA Problems**

- No reporting system or database specifically for identifying ambulance crash related injury
- No occupational and health safety standards to protect providers from injury
- Rear passenger compartment, > 60cm behind driver - exempt from Federal Motor Vehicle Safety Standards (FMVSS)

**USA Ambulances: FMVSS Exempt**

Ambulances must comply with some of the present safety and performance standards applicable to vehicles on the United States. For motor vehicles operated on public roads and highways, these must comply with Federal Motor Vehicle Safety Standards (FMVSS) 301, 302, 303, and 306. [16 C.F.R. Parts 100, 101, 102, and 103] Ambulances are exempted from these standards for the protection of professional personnel and patients in the event of an accident or highway crash. The vehicles are subject to FMVSS 571, which are the crashworthiness standards, the design, engineering, and production of such vehicles. Ambulances purchased for use by governmental agencies, and the vehicles bought or provided by channels outside of the public, also must be certified to the safety requirements of the Motor-vehicle safety standards for ambulances, while again, predicated by the government agencies.
And very Predictable...

- Intersections are lethal environments

So... The real world for an EMS vehicle approaching a red light

- You think they heard you...
- You know they must have seen you...
- And maybe they did
- But...
- There is NO way humanly possible that they could stop.....

The real world
Intersection passenger car stopping distance* at 40 mph dry and wet

Increasing awareness...

What do we know now??

- Intersection crashes are the most lethal
- There are documented hazards, some which can be avoided
- Occupant and equipment restraint with standard belts is effective. (Over the shoulder harnesses for patients should be used, with the gurney in the upright position where medically feasible)
- Some vehicle design features are beneficial - automotive grade padding in head strike areas, seats that can slide toward the patient
- Electronic Driver monitoring/feedback systems appear to be highly effective
- Head protection??

No need to reinvent the wheel...

Unique workplace

- In vehicles
- At roadside and other emergency scenes
The ‘workplace’ IS a vehicle

- EMT’s often in vulnerable positions during transport.
  - Bench seat
  - Captain’s chair
  - Standing or kneeling

View of Ambulance interior from Rear

The ‘workplace’ is also a crash scene

Tort Claims from Adverse Events in Emergency Medical Services

- Henry E. Wang, Rollin J. Fairbanks, Manish N. Shah, Donald M. Yealy, University of Pittsburgh, Pittsburgh, Pennsylvania, Jan 2007

Methods: 2003-2004 liability claim records that resulted in injury to patients or other individuals.

- 275 cases, with emergency response in 46% and nonemergency response in 39%.
- Ground ambulances (67%) and wheelchair vans (19%).

Adverse event categories included:

- Patient handling (40%),
- Emergency vehicle movement or collision (31%),
- Medical management (11%),
- EMS response or transport (8%),
- Lack or failure of equipment (4%), and other errors (9%).

Patient handling errors included:

- Stretcher or wheelchair “tips” (28%),
- Patient drops (31%),
- Injury during patient movement (19%),
- Patient falls (13%).

Conclusions: Patient handling errors and emergency vehicle movement/collisions are the most common adverse events resulting in tort claims against EMS. Other incidents are less frequent but incur higher individual costs. These findings highlight key areas for improving EMS patient safety.

2007!!

2007!!

Precious Cargo

But what about head protection?

Role of a head protective device

- A simple, immediate and inexpensive adjunct – a protective device -

- To protect occupants from hazardous interiors
- As vehicle crashworthiness design advances
- As driver training advances
- For when equipment becomes unsecured
- As EMS Safety Standards are developed, for both EMS vehicles and EMS occupational safety
Hmm…

So why is it…

- That the EMS providers -
  - Were wearing navy blue – one of the most difficult colors to see at night
  - Had no head protection, when all other emergency personnel at the scene did
  - Had no protective clothing, when other emergency personnel at the scene did???

It isn’t like this outside of the USA

eg: Scandinavia Innovation in Vehicles, and Equipment

This looks cool AND SAFE!

Not rocket science.

Global EMS Vehicle Safety Standards
- Specifications and Guidelines
  - EMS Safety and Performance Standards
    - Australia & New Zealand 4535
    - Common European Community (CEN) EN1789
  - Non EMS Specific USA Standards
    - (Aviation - FAA/CAA/JAA)
    - 215 – Fleet vehicles safety management
  - USA EMS Specification & Guidelines
    - Purchase Specification: KHH & NTEA – AMD
    - Guidelines: EMSC Dos and Don’ts
    - ASTM, CAAS and CAMTS
USA ambulance purchase specifications  
- Static Pull test
- 2200 Lbs. (8G’s) in Longitudinal and Lateral
- No dynamic test
- No definition to manikin mass
- No restraint for equipment
- Voluntary

American National Standard  
ANSI/ASSE Z15.1-2006  
Safe Practices for Fleet Motor Vehicle Operations

What Z15 encompasses
- Safety Program
- Safety Policy
- Responsibilities and Accountabilities
- Driver Recruitment, Selection and Assessment
- Organizational Safety Rules
- Orientation and Training
- Reporting Rates and Major Incidents to Executives
- Oversight

Dynamics of Fleet Safety - NSC

Crash Prevention
- EVOC
- Tiered Dispatch
- The “Black Box”
- Intelligent vehicle design
- Appropriate policy

Intelligent Transport Safety Systems

Back up Camera…. Shouldn’t all vehicles have one of these?

The “black box”  
Driver behavior monitoring and feedback device

Purpose of ‘Onboard Computer’ Program
- Enhance Safety
- Improve Driver Performance
- Save Maintenance Dollars
- Aid Accident / Incident Investigation
The “black box” - A transportation safety monitoring and feedback device
This technology is conceptually like a vehicle safety ‘pulse oximeter’ – that with auditory feedback - can save your life, your coworkers life, your patients life, and others on the road

No need to reinvent the wheel...

Active Projects
(all due early 2007)
- Commercial Motor Vehicle Driver Training Curricula and Delivery Methods and Their Effectiveness
- Commercial Motor Vehicle Carrier Safety Management Certification
- The Role of Safety Culture in Preventing Commercial Vehicle Crashes
- The Impact of Behavior-Based Safety Techniques on Commercial Motor Vehicle Drivers
- Health and Wellness Programs for Commercial Motor Vehicle Drivers

Patients must be in the over the shoulder harness, medics restrained in seat belts, equipment secured

FDNY a leader in safety

Safety Enhancements Being Implemented
- EVOC
- Tiered dispatch
- Monitoring & Feedback devices
- Helmets
- Optimized ambulance vehicle design
- Protective clothing
- Visibility

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Occupational Health and Safety......?
- This IS an Automotive Safety issue

Paramedic charged in crash that killed 2
Dynamic Safety Testing
- Requires sophisticated, expensive equipment
- Measurably demonstrates forces generated during collision
- Accepted international standard for vehicle restraint systems

Full Vehicle Crash Tests
- Test 1 – Right side impact
- Test 2 – Frontal

Automotive Safety PPE
- Automotive restraint in the EMS environment is a specialized form of PPE
- Ergonomic or Occupational Health and Safety expertise is key to workplace safety – but is outside of expertise with a history of automotive crash safety or vehicle/restraint safety testing
- The automotive safety industry is THE industry where the safety of devices that are for the protection of occupants in a moving vehicle, are best evaluated

Air EMS is a role model for safety initiatives and focus

EMS Risk/Hazards
- Predictable risks
- Predictable fatal injuries
- Serious occupational hazard
- Public safety hazards

Safety Management
- A Safety Culture
- Protective Policies
- Protective Devices
  - In the event of a crash
  - To prevent a crash
- Continuous Education and Evaluation
Creating a Safety Culture
within a company must start with upper management’s commitment to safety

- Awareness
- Training
- Incentive

An excellent model

16 Firefighter Life Safety Initiatives
www.EveryoneGoesHome.com

1. Define and advocate the need for a cultural change relating to safety; incorporating leadership, management, supervision, accountability and personal responsibility.
2. Enhance the personal and organizational accountability for health and safety.
3. Focus greater attention on the integration of risk management with incident management at all levels, including strategic, tactical, and planning responsibilities.
4. All must be empowered to stop unsafe practices.
5. Develop and implement national standards for training, qualifications, and certification based on the duties expected to perform.
6. Develop and implement national performance related medical and physical fitness standards.
7. Create a national research agenda and data collection system.
8. Utilize available technology to improve health, safety, and risk management.
9. National programs support the implementation of safe practices and mandate safe operations for all agencies, organizations, industries, and professionals.
10. Develop national protocols for response to violent incidents.
11. Ensure national protocols for response to violent incidents.
12. Support national standards for response to violent incidents.
15. Support national standards for response to violent incidents.
16. Safety must be a primary consideration in the design of apparatus and equipment.

USA design initiatives

New Australian vehicles

Flexibility to manage two patients

High speed crash, rolled and the occupants (patient and medics) had only minor scratches
Clear safety message

Sweden initiatives

Norway initiatives

Other successful models

So....
- Which vehicle do you want to be in?
- Which vehicle is the best for efficient, and effective patient care?
- Which vehicle provides optimal risk management?
- What is the optimal fleet mix?

Safety Enhancements Being Implemented
- EVOC
- Tiered dispatch
- Monitoring & Feedback devices
- Helmets
- Optimized ambulance vehicle design
- New Policies and Standards

Important Principles!
1. A culture of safety
2. Drive cautiously
3. Wear your belts & restrain all occupants
4. Secure all equipment
5. Integrate scientific data into your policies and procedures
- Unrestrained occupants and equipment are a potential injury risk to all occupants

Very Important Principle
Ambulance transport safety is part of a SYSTEM, the overall balance of risk involves the safety of all occupants and the public

small changes can make a BIG DIFFERENCE
- PREPARE – TEACH – REACH – RESPOND
  - Look at your own safety record
  - Teach safety and hazard awareness
  - Reach out with safety information to all your EMS providers
  - Respond with the best safety practices
Conclusion

- Major advances in EMS safety research, infrastructure and practice over the past 5 years
- New technologies for vehicle design, occupant PPE and equipment restraint and driver performance are now available
- Development of substantive EMS safety standards is a necessity and a reality
- Enhanced inter-disciplinary collaboration in development of safety initiatives now exist
- EMS is still way behind the state of the art in vehicle safety and occupant protection

And....

- It is no longer acceptable for EMS to be functioning outside of automotive safety and PPE safety standards for prevention of and protection of EMS providers and the public from injury and death

EMS Safety
Policy that Reflects SCIENCE

Thank you! Any Questions??
http://www.objectivesafety.net