Where is the State of the Art of Ground Operations Safety?

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Oglebay West Virginia, May 1, 2007

A tragic emergency health care intervention outcome

It does happen....

Last Week

A few weeks ago in New York

Major deal...

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.....

Objectives
1. Educate on the risks to patients, transport and emergency medical service providers and the public from ambulance crashes.
2. Explore factors related to ambulance crashes and identify potential mechanisms of injury to patients and transport providers.
3. Explain new transport safety technologies and innovations, and describe the new concepts that are underdevelopment.
4. Instruct providers on strategies for enhancing transport safety and reducing risk of injury to patients and providers during transport.

Your Interactive Handout awaits you online...

www.objectivesafety.net

http://www.objectivesafety.net
Last month…

Some recent adverse outcomes

UPS and Laundry trucks have very similar design and even more stringent safety requirements to EMS vehicles BUT very different cargo..... People are passengers and NOT packages or parcels

A few weeks ago...

An interhospital transport ? “Do no harm....” ?

August 16th...

August 22, 2005....

Firstly!

An ‘Accident’.... ?

An accident ?

or a predictable and preventable event
So…

- On their way TO the hospital
- With a patient who was not in cardiac arrest or in a life threatening situation
- All 5 in the ambulance critically injured

EMS Best Practice, Sept 2006

1970 to 2007

Ambulance Safety Research: A New Field

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 2.5 vs restrained)
- 42% of fatally injured EMS rear occupants unrestrained
- 74% of EMS occupational fatalities are MVC related
- Serious head injury in 65% of fatal occupant injuries
- 70% of fatal crashes EMS crashes during Emergency Use
- More likely to crash at an intersection with traffic lights (57% vs 43% p=0.001)

And what is killing EMS?

EMS personnel fatalities

- 74% transportation related
- 11% were cardiovascular
- 9% were homicide
- 4% needle sticks, electrocution, drowning and other

USA EMS

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

So does it make sense?

- Gloves and universal precautions?... good biohazard protection BUT aren’t going to give much protection in a ambulance crash

A word about occupational transportation fatalities...

WE HAVE A BIG PROBLEM HERE
Safety oversight of what and by whom:
- Vehicle Safety
- Vehicle Design
- Safety Equipment Design
- Vehicle and Safety Equipment Testing and Standard development
- Safety policies

The EMS transport process:
- Communications/dispatch
- the patient
- restraining device/seat
- transporting device/gurney
- paramedics/transport nurses, doctors & family
- patient monitoring equipment
- clinical care & interventions
- protective equipment
- the vehicle
- the driving/behaving skill
- other road users
- the road

The Emergency Department (ED)

An ambulance is not an ED / ICU on wheels

Is there an acceptable rate of morbidity and mortality for pre-hospital transport systems?

This is not acceptable

In the USA:
- ~ 5,000 crashes a year
- ~ One fatality each week
  - ~ 2/3 pedestrians or occupants of other car
  - Approximately 4 child fatalities per year
  - ~10 serious injuries each day
- Cost estimates > $500 million annually
- USA crash fatality rate/capita 35x higher than in Australia

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This IS an Automotive Safety issue

Paramedic charged in crash that killed 2

This IS an Automotive Safety issue

The Emergency Department (ED)
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?

EMS Transport Safety is Complex and Multidisciplinary

- Epidemiological Data Collection
- Risk Management
- Public Safety
- EMS Policy
- Training
- Fleet Safety
- Technology
- Research and Standards
- EMS Practice
- PPE
- Biohazard/Chem Research
- EMS Safety
- Ergonomic Research
- Biomechanical Automotive Safety

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

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
and who’s life was he racing to save?

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

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

Increasing awareness ...

Tips for Emergency Vehicle Operations

And very Predictable...

Intersection 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

Stopping distance:
Perception time + Reaction time + Vehicle braking time (varies with age, skill, weight, vehicle type, tire pressure, road etc)

* Stopping distance:
Perception time + Reaction time + Vehicle braking time (varies with age, skill, weight, vehicle type, tire pressure, road etc)
It does happen…

But what about head protection?

New EMS helmet prototypes for 2006-2007

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

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
A key to safe ambulance transport

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??

Dynamic Safety Testing
- requires sophisticated, expensive equipment
- measurably demonstrates forces generated during collision
- accepted international standard for vehicle restraint systems

If we know this – and its published....

Why do we do this?
Patients must be in the over the shoulder harness, medics restrained in seat belts, equipment secured
Being seated IN an automotive seat is what will protect you

- Anything that allows or encourages you to get up out of your seat will also encourage you to be injured or killed – it is potentially lethal to be out of your seat in any fashion.
- 4 or 5 point harnesses for side-facing occupants are potentially lethal – and is in NO WAY SUPPORTED BY ANY DATA OR AUTOMOTIVE SAFETY EXPERTISE.

Were we safer in the Cadillac???

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 comprehensive risk management, responsibility, accountability, and ongoing improvement.
2. Set a consistent safety standard across all levels of the organization.
3. Focus greater attention on the integration of risk management with incident management strategies.
4. Develop and implement national standards for training, qualifications, and certification relating to the various roles and responsibilities.
5. Enhance the personal and organizational accountability for health and safety.
6. Focus on the development of a national research agenda and data collection system.
7. Implement a national research agenda and data collection system.
8. Thoroughly investigate all fatalities, injuries, and near misses.
9. Emphasize the importance of risk management in a culture of safety and shared values.
10. Establish a national standard for training, qualifications, and certification.
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USA design initiatives

New Australian vehicles
High speed crash, rolled and the occupants (patient and medics) had only minor scratches

UK Ambulance vehicles

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

Future
- Meaningful Goals
- New policies
- New practices
- New standards
- New vehicles
- New technologies
### 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

- EMS transport has serious hazards and safety issues
- 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 cross 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

### Thank you!

Any Questions??

Electronic handout available online
http://www.objectivesafety.net

**Predictable, Preventable, and NO Accident**