A tragic emergency health care intervention outcome

Outline

- Review of data on ambulance crashes and crash safety
- Identification of safety issues, hazards and areas of risk for EMS vehicles
- Review of safety standards and guidelines, and an update of the latest safety developments
- Strategies to enhance safety and reduce risks of EMS transport related crash and injury

Firstly!

- An accident?
- or a predictable and preventable event
EMS Best Practice, Sept 2006

Ambulance Safety Research: A New Field

- 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)*
- 82% of fatally injured EMS rear occupants unrestrained**
- > 74% of EMT occupational fatalities are MVC related***
- 72% of fatal crashes EMS crashes during Emergency Use**
- More likely to crash at an intersection with traffic lights (37% vs 18% p=0.001) & more people & injuries/crash than similar sized vehicles#

Predictable risks

- EMS Provider 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)

- EMS personnel fatalities*
  - 74% transportation related
    - 15% of ground transport fatalities were struck by moving vehicles
    - 11% were cardiovascular
    - 9% were homicide
    - 4% needle sticks, electrocution, drowning and other

- WE HAVE A BIG PROBLEM HERE

USA EMS

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

A word about occupational transportation fatalities...

- We have a big problem here

The ‘workplace’ IS a vehicle

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

The ‘workplace’ is also a crash scene

- View of Ambulance interior from rear
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 driver/driving skill
- other road users
- the road

The Emergency Department (ED)

An ambulance is not an ED / ICU on wheels

EMS Transport Safety IS Complex 
AND Multidisciplinary

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
- ~ 23 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

Occupational Health and Safety.....?

This IS an Automotive Safety issue

Is it your services tragic year?

- ~ 50 fatalities a year
- 15,000 EMS services
- Each year one in 300 services experiences a fatality

Paramedic charged in crash that killed 2

*FARS/BTS 2004-5

USA crash fatality rate/capita 35x higher than in Australia
Key Issues

- Mythology
  - That Emergency Medical Service personnel are safe
- Injury Hazards
  - Radiation
  - Chemical/Radiological
  - Physical/Mechanical trauma - THE BIG PROBLEM
- Motor Vehicle Crashes are the highest cause of death at work - EMS has > 2X the mean national rate
- An R & D and Regulatory Gap
  - Occupational Health and Safety
    - the workplace in a vehicle - exposure data are scant
  - Automotive Safety
    - a vehicle is the workplace - 'exempt' from automotive research and development

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 ?

Some simple and available solutions out there now

- Intersection Policy
- PPE
- Black boxes

Goals

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

Hot off the press… from the IFAC and USFA
NAEMT July 2006 Position statement

Tips for Emergency Vehicle Operations

USFA Emergency Vehicle Safety Initiative

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

and who’s life was he racing to save?

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

Some recent adverse outcomes
- May 16th 2006
  Colorado, USA
- June 28th 2006
  Phoenix, USA

- May 3rd 2005
  New York, USA

- May 10th 2006
  Colorado, USA
A closer look

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....

Predictable

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??

Very Predictable...

Intersection are lethal environments
No need to reinvent the wheel...

'Workplace' Hazards

It does happen....

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

New EMS helmet prototypes for 2006-2007

EMS has unique head protection needs – not well met by a ‘truncated’ fire helmet...
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

The difference having data makes?

This looks cool AND SAFE!

Not rocket science...

Global EMS Vehicle Safety Standards v 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)
  - Z15 – Fleet vehicles safety management
- USA EMS Specification & Guidelines
  - Purchase Specification: KKK & NTEA – AMD
  - Guideline: EMSC Dos and Don'ts
  - ASTM, CAAS and CAMTS

USA ambulance purchase specifications GSA:KKK-A-1822E, 2002
- 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

Automotive Injury Triangle
and Safety Development

Host Vehicle

Technology, invention &
Voluntary initiatives

Environment

Field Data

Scholarly Research

To prevent a crash

Driver feedback

Driver monitoring

Vehicle Intelligent Transportation System (ITS)

Voluntary initiatives

Appropriate policies

In the event of a crash

Vehicle crashworthiness

Equipment lock downs

Head protection

Purpose of ‘Black Box’
Program

Enhance Safety

Improve Driver Performance

Save Maintenance Dollars

Aid Accident / Incident Investigation

The jury is out on

Opticon

Simulators

Active Projects
(all due late 2006)

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

Demonstrated Effectiveness

The “Black Box”

Driver behavior monitoring and feedback device

MEMS ABC Miles Per Month

STOP NOW
The Crash Event - Crash Testing

- An introduction
- What one needs to know
- What do the tests really mean
- And, what tests are meaningful

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

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

Patients must be in the over the shoulder harness to protect you too.

Air EMS is a role model for safety initiatives and focus

Safety Management

- A Safety Culture
- Protective Policies
- Protective Devices
- In the event of a crash
- To prevent a crash
- Continuous Education and Evaluation

EMS Risk/Hazards

- Predictable risks
- Predictable fatal injuries
- Serious occupational hazard
- Public safety hazards
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

UK Ambulance vehicles

Sweden 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

PREDICTABLE
PREVENTABLE
and
NO ACCIDENT

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

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

Any Questions??

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