





Outline

- l. Look at the data on ambulance transport safety
- II. Highlight important predictable and preventable occupant risks and hazards during neonatal and pediatric transport
- III. Demonstrate what happens during an ambulance crash
- V. Review of guidelines, standards and innovation
- Outline practices and strategies to enhance occupant safety and reduce risks of crash-related injury



Key Issues Mythology That Emergency Medical Service personnel are safe Injury Hazards Blohazard Chemical/Radiation 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 is in a whicle – exposure data are scant Automotive Safety a whicle is the work place – 'exempt' from automotive research and regulation

Pediatric Patient Transport Safety IS Complex AND Multidisciplinary Epidemiological Data Collection Risk Management Transport Practice Ergonomic Research Transport Policy Blomechanical Automotive Safety Blomechanical Fleet Safety Fleet Safety Fleet Safety Regulations and Standards



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



Peds Transports

- ► ~One in ten (~ 6 million) ambulance transports involves a child
- Only ~ 1.8 million are children <5 yrs
- Ambulances ≠ standard passenger vehicles
- Pediatric patients in ambulances ≠ children in passenger cars
- Standard automotive safety practices cannot be applied directly to ambulances

Kids are not little adults Behavior Fear Development Size and shape **Biomechanics**

Safety in Pediatric **Ambulance Transport**

▶Is part of a SYSTEM







"Are our policies killing people?"

- ▶ 1991-2000, 302,969 Emergency vehicles were involved in MVCs 1,565 involving fatalities*
- In PA 1997-2001, ambulances were more likely than similar sized vehicles to be involved in*:
- 4 way intersection crashes (43% vs 23%, p=0.001)
 Collisions at traffic signals (37% vs 18%, p=0.001)
 MVCs with more people injured (76% vs 61%, p=0.001)

*Comparison of Crashes Involving Ambulances with those of similar sized vehicles – Adam Ray, Douglas Kupas, PEC Dec 2005;9:412-415

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
- There is NO way humanly possible that they could stop.....

This is not acceptable

- ▶~ One fatality each week#
- ~ 2/3 pedestrians or occupants of other car
 ~ 4 child fatalities per year (>2X airbags 2004-2005)
- ▶~10 serious injuries each day
- Cost estimates > \$500 million annually
- USA Crash fatality rate/capita 35x higher than in Australia



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)

- restrained)*
 82% of fatally injured EMS rear occupants unrestrained*
 > 74% of EMT 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
 (37% vs 18%, p=0.001) & more people & injuries/crash than,
 similar sized vehicles##



What do we know now??

- Intersection crashes are the most lethal
- There are documented hazards, some which can
- De 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??

Balance of concerns and risk during transport



- ► Response and transport time
- ► Clinical care provision
- ► Occupant safety/protection
- Public Safety

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
- Much uncertainty as to what is safe and what is unsafe occupant protection practice
- 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

USA Ambulances: FMVSS Exempt

Multidisciplinary collaboration and the way forward

- ▶ Development of interdisciplinary teams
- healthcare professionals
- safety engineering expertise
- regulatory bodies
- ► Safer practices save lives, time and money

Protective devices/concepts

In the event of a crash

- Vehicle crashworthiness
 Seat/seat belt systems
 Equipment lock downs
- Padding Head protection

To prevent a crash

- Driver feedback
 Driver monitoring
 Driver training
 Vehicle and other technologies
 Tiered dispatch
 Appropriate policies

Crash Occupant Protection

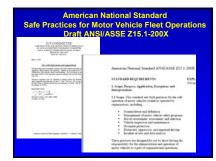
- collision speed
- direction of impact
- vehicle stiffness and mass
- compartment size & projectiles intelligent vehicle technology
- passive protection
- head protection
- occupant restraint/belts

Safety for emergency transport

Policy that reflects SCIENCE

Global EMS Vehicle Safety Standards v Specifications and Guidelines

- EMS Safety and Performance Standards
 Australia & New Zealand 4535
 Common European Community (CEN) EN1769
 (International Joint Commission on Medical Transport)
 Non EMS Specific USA Standards
 (Invitation FANCANJAIA)
 [Draft Z15 fleet vehicles]
 USA Other
 Purchase Specification: KKK & NTEA AMD
 Guideline: EMSC Dos and Donts, and (CAAS and CAMTS)





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

USA EMS Risk/Hazards

- ▶ Predictable risks
- ▶ Serious occupational hazard
- ► Predictable fatal injuries

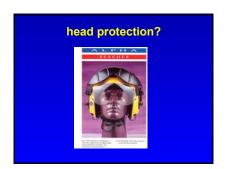
This is about you and your safety

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













Creating a Safety Culture

within a company must start with upper management's commitment to safety

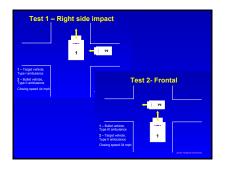
- ► Awareness
- ► Training
- ► Incentive

Safety process

- ► Identify hazards
- ► Raise awareness of safety issues
- Create a safety attitude
- ▶ Promote Teamwork
- ► Provide motivation
- ► Accomplish established goals

Dynamic Safety Testing

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













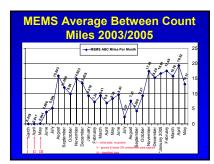


New concepts out there now

- ▶Black Boxes
- Tiered dispatch
- Helmets
- Enhanced ambulance vehicle design
 Cross disciplinary ambulance
 transport safety task force established







Results

- ► A dramatic improvement in driver performance in every measured area
- ► Crews accepted "big-brother" without complaint
- Sustained improvement in safety proxies over a 15 month period, with no inservice or retraining after the initial introduction period.
- ► No change in response times
- Fewer crashes and less severe crashes
- QA Proof we didn't stop at McDonald's















Important Principles!

1. Ambulances are NOT standard passenger vehicles

Important Principles!

2. Pediatric patients in ambulances have needs which differ from children in passenger cars

Important Principles!

3. Design, performance and practice policy should be based on properly conducted science

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

Very Important Principles!

- A culture of safety
- **Drive cautiously**
- Wear your belts & restrain all occupants
- Secure all equipment
- Integrate scientific data into your policies and procedures
 - Unrestrained occupants and equipment are a potential injury risk to all occupants

PREDICTABLE PREVENTABLE and **NO 'ACCIDENT'**

Conclusion

- Major advances in EMS transport safety research, infrastructure and practice over the past 5 years
- past 5 years

 New technologies for vehicle design, occupant
 PPE and equipment restraint and driver
 performance are now available
 Development of substantive 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

Conclusions

- Prevention is key the transport environment includes predictable and preventable risks.
- Every member of a transport program must play a role to actively manage risk and to avoid taking unnecessary risk.
- Pediatric transport in ambulances ≠ passenger
- Focus on safety of ALL aspects of the ambulance environment safer patient transport practices exist & should be used
- Basic but important Unrestrained occupants and equipment are a potential injury risk to all occupants

Conclusions

- New safety developments are underway: be ready to integrate them into your practice
- practice
 There is a need for a defined pathway for translation of problem identification to resolution and policy implementation
 The absence of any national infrastructure for safety oversight in patient transport is not an acceptable situation. situation
- And above all WE NEED DATA

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

Electronic Info:

- Electronic Handout of today's presentation
- "Ambulance Safety: Where is the State of the Art?" Webinar June 14, 2005 Recorded online Free access via the internet
- Comprehensive Reference List on EMS Safety

