

GA EMS Conference,
Sea Palms Tennis & Golf Resort, St. Simon Island, GA 2006

"Why Can't He Ride In Mother's Lap? - Safe Transporting the Pediatric Patient"



Nadine Levick, MD MPH

Outline

- ▶ Look at the data on EMS transport safety
- ▶ Demonstrate what happens during an ambulance crash
- ▶ Review of national guidelines and standards
- ▶ Address what needs to be done to enhance safety in EMS transport

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and your electronic handout awaits you online!



Science/Health

Groundbreaking Research

For Children, a Safer 1

EMSC news

Crash Testing for Pediatric Ambulance Transport Safety Begins



Key Issues

- ▶ Mythology
 - That Emergency Medical Service personnel are safe
- ▶ Injury Hazards
 - Biohazard
 - 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 vehicle – exposure data are scant
 - Automotive Safety
 - a vehicle is the work place – 'exempt' from automotive research and regulation

Safety oversight of what and by whom

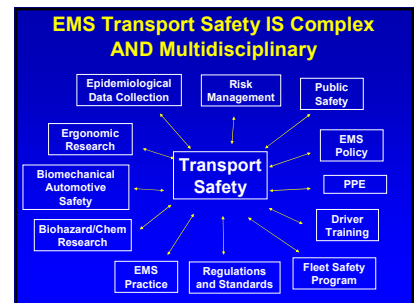
- ▶ Vehicle Safety
- ▶ Vehicle Design
- ▶ Safety Equipment Design
- ▶ Vehicle and Safety Equipment Testing and Standard development
- ▶ Safety policies

Goals

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

Safety in Pediatric Ambulance Transport

- ▶ Is part of a SYSTEM



the Peds EMS/transport process

- ▶ communications/dispatch
- ▶ policies and procedures
- ▶ the pediatric patient
- ▶ restraining device/seat
- ▶ transporting device/gurney
- ▶ paramedics/transport nurses, doctors & family
- ▶ patient monitoring equipment
- ▶ clinical care & interventions
- ▶ the vehicle
- ▶ the driver/driving skill
- ▶ the road



Firstly!

▶ **An accident ?**

- ▶ or a predictable and preventable event

This is not acceptable

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

*FARS/BITS 2004

Ambulance Safety Research: A New Field

Don Barry
Transport Canada, Ministry of Health

engineering

ergonomic

epidemiology



In press

ARTICLE IN PRESS

CLINICAL PRACTICE

Child and Provider Restraints in Ambulances: Knowledge, Opinions, and Behaviors of Emergency Medical Services Providers

Tiffany D. Johnson, DO, David Lindholm, MD/MT-P, M. Devlin Dwyer, MD, MPH

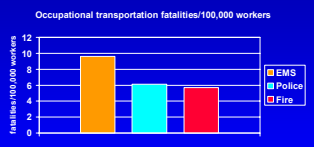
Abstract
Background: Approximately 80,000 children are transported by ambulance each day, and there are an estimated 8,000 ambulance crashes each year. Information about emergency medical services (EMS) provider knowledge, opinions, and behaviors regarding occupant restraint is lacking.
Objective: To measure the knowledge, opinions, and behaviors of EMS personnel regarding child and provider restraint use in ambulances.
Methods: A survey was given to all EMS providers in two large ambulance services organizations and to a hospital-based pediatric population in an academic setting.
Results: A total of 800 EMS providers were surveyed, for a response rate of 67%. Nearly half were females. The majority were EMTs, followed by paramedics. The majority were employed by fire departments. The majority were employed by fire departments. The majority were employed by fire departments.
Conclusion: EMS providers have limited knowledge and opinions regarding child and provider restraint use in ambulances. Further research is needed to improve EMS provider knowledge and behaviors regarding child and provider restraint use in ambulances.

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)**
- ▶ 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##

*Hahn CA, Pivetti RD, Rubin EM. *Prehosp Emerg Care* 2001; 6(5):291-9.
**Baker, Zaslavsky, Lovick, Li, Miles. *Acc Anal Rev* 2003.
***Maguire, Hunting, Smith, Lovick. *Annals Emerg Med* Dec 2002.
****SOS-01, 2003.
#Maguire AM, Kucias DF. *Prehosp Emerg Care* 2005; Dec; 9:412-415.
##NHTSA. 43 CFR Parts 271, 272 & 268. Document no. 20-02, 00000-7.

A word about occupational transportation fatalities..



▶ WE HAVE A BIG PROBLEM HERE

* Maguire, Hunting, Smith & Lovick, Occupational Fatalities in Emergency Medical Services: A Hidden Crisis, *Annals of Emergency Medicine*, Dec 2002

We should use the best safety practices demonstrated

Development of an Effective Ambulance Patient Restraint

Development and Application of a Dynamic Testing Procedure for Ambulance Pediatric Patient Restraint Systems

2001-01-1173

Biomechanics of the patient compartment of ambulance vehicles under crash conditions: testing countermeasures to mitigate injury

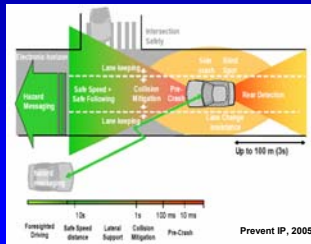
Reviewing ambulance design for clinical efficiency and paramedic safety

Angela Ferraro, Sue Hyatt

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??

Intelligent Transport Safety Systems



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.....

Transport Safety Guidelines EMSC/NHTSA fact sheet

The Do's and Don'ts of Transporting Children in an Ambulance

Do's

- DO drive cautiously at safe speeds observing traffic laws.
- DO tightly secure all monitoring devices and other equipment.
- DO ensure available restraint systems are correctly used on all occupants, including the patient.
- DO transport children who are not patients, properly restrained, in an absolute passenger vehicle, whenever possible.
- DO encourage utilization of the DOT NHTSA Emergency Vehicle Operating Course (EVO-C), National Standard Curriculum.

Don'ts

- DO NOT drive at unsafe high speeds with rapid acceleration, deceleration, and turns.
- DO NOT have monitoring devices and other equipment unsecured in moving EMS vehicles.
- DO NOT allow parents, caregivers, EMTs or other passengers to be unrestrained during transport.
- DO NOT have the child/infant held in the parent, caregiver, or EMT's arms or lap during transport.
- DO NOT allow emergency vehicles to be operated by anyone who has not completed the DOT EVO-C.

<http://www.ems-c.org>
<http://www.nhtsa.dof.gov>

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

Z15 Incident Rates

- ▶ Incident rate based on number of vehicles operated:
 $\text{Incident rate} = \frac{\text{Number of incidents} \times 100}{\text{Number of vehicles}}$
- ▶ Incident rate based on vehicle mileage:
 $\text{Incident rate} = \frac{\text{Number of incidents} \times 1,000,000}{\text{Vehicle mileage}}$
- ▶ Injury incident rate based on vehicle mileage:
 - Injury incident rates, the most frequently used indicator of incident severity, are useful for tracking events that have the potential to affect financial or operational performance of the operating unit.
 - $\text{Injury incident rate} = \frac{\text{Number of incidents with injury} \times 1,000,000}{\text{Vehicle mileage}}$
- ▶ Incident rates based on service activity:
 - Motor vehicle operations that pose injury risks other than those associated with driving should also use the service activity as the basis of a safety performance rate. The number of deliveries, stops, or loads should be considered as appropriate indicators of performance.
 - $\text{Incidents per 10,000 transports} = \frac{\text{Number of incidents} \times 10,000}{\text{Number of transports}}$
- ▶ Vehicle injury rates based on work hours:
 $\text{Vehicle incidents per 200,000 hours} = \frac{\text{Number of incidents} \times 200,000}{\text{Number of hours worked}}$

Safety Management

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

Risk to who?

- ▶ Health care interventions that are a risk to:
 - Patients (their families?)
 - Providers
 - Public

USA EMS Risk/Hazards

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

EMS Safety

- ▶ 'patient safety'
- AND also
- ▶ 'provider' and 'public safety'

The 'workplace'

- ▶ Transport provider's often in vulnerable positions during transport.

- Bench seat
- Captains chair
- Standing or kneeling



View of Ambulance interior from Rear



Air EMS is a role model for safety initiatives and focus

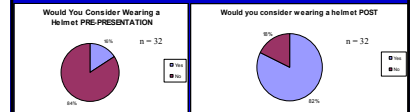


Role of a head protective device

- ▶ 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

Preliminary Study: Attitudes to Head Protection in EMS



It isn't like this outside of the USA



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

Creating a Safety Culture

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

- ▶ Awareness
- ▶ Training
- ▶ Incentive

Identifying predictable and preventable transport related risks and hazards

- ▶ Systems approach
 - Communications
 - Personnel
 - Transport
 - Equipment
 - Environment

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
- ▶ Intelligent Transport Technologies - ITS
- ▶ New Safety Standards

The "Black Box"

Driver behavior monitoring and feedback device



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 !

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

**PREDICTABLE
PREVENTABLE
and
NO 'ACCIDENT'**

Future

- ♦ Goals
- ♦ New vehicles
- ♦ New technologies
- ♦ Futuristic vehicles
- ♦ New policies
- ♦ New practices
- ♦ New Standards

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.
- ▶ Focus on safety of ALL aspects of the transport environment
- ▶ New technologies for vehicle design, occupant PPE and equipment restraint and driver performance are now available: be ready to integrate them into your practice
- ▶ There is a need for a defined pathway for translation of problem identification to resolution and policy implementation

Conclusion

- ▶ Major advances in EMS transport safety research, infrastructure and practice over the past 5 years BUT patient transport safety is still way behind the state of the art in vehicle safety and occupant protection
- ▶ Development of substantive safety standards is a necessity and a reality
- ▶ The absence of any national infrastructure for safety oversight in patient transport is not an acceptable situation
- ▶ And WE NEED DATA

And....

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

Electronic Info:

www.objectivesafety.net

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

