

Child Passenger Safety Conference,
NHTSA Region II
Atlantic City, New Jersey, September 26th, 2008

**Ambulance Transport Safety -
Where is the State of the Art?**



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► To quote Steve "Sid" Caesar –
Director IHS ES

**"We want everyone to get home
safely each day"**

**National Child Passenger Safety Week
September 21-27, 2008**



Notice to Readers: National Child Passenger Safety Week — September 21–27, 2008

In 2008, in the United States, 402 children aged 1 year, 483 and approximately 13,000 were injured in motor-vehicle accidents (1). This year, National Child Passenger Safety Week, September 21–27, 2008, will focus on the importance of the correct installation and use of child safety seats. The use of child safety seats has been found to reduce the risk for death by 70% for infants and by 53% for children 1–12 years (2). Child safety seats are mandatory in every state in the United States and in the District of Columbia, although the age at which children can transition to adult safety seats varies by state. As the use of child passenger safety seats continues to increase, the National Highway Traffic Safety Administration (NHTSA) estimates that 2008 will see 20% of children aged 1–12 years and placed in a motor vehicle seat, and 87% of children who weighed 20–40 pounds were not in forward-facing child seats, as recommended by NHTSA (3). An estimated 77% of child safety seats are incorrectly installed or secured (3). The same incorrect use of child passenger seats will have a negative impact on the child safety seat in the vehicle using the seat belt or LATCH (4). Accurate and reliable child passenger safety seat information is available from NHTSA at www.safercar.gov and from CDC at www.cdc.gov/nceh/od/ohrt/childpassenger.htm.



Child Passenger Safety



EMS Transport Safety

► 'patient safety'
AND also
► 'provider' and 'public safety'

A tragic emergency health care intervention outcome

Rollover Crash Kills Medical Technician
Ambulance Flips Off I-95 and Kills One Staffing, One Transporter and a Patient

It does happen....

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.....

- ▶ Biomechanics
- ▶ Ergonomics
- ▶ Fleet safety

- ### Objectives
- ▶ To identify the safety issues that are key regarding pediatric patient transport for the patient, the provider and the public
 - ▶ To describe safety innovation and dispel safety myths
 - ▶ To instruct providers on strategies for preventing crashes and for reducing risk of injury to patients, providers and the public during transport

... Nov 8th's Fatality

Putnam Co. paramedic dies in ambulance crash

YONKOLA, N.Y. — A Putnam County paramedic, returning from an ambulance call has died after the vehicle veered off the road and struck a tree.

Authorities say Matthew Lamb of Carmel was riding in an ambulance ambulance Corp. vehicle at 6 p.m. Wednesday when it veered off the road and struck a tree in Ganswon.

Lamb suffered massive head trauma.

State police color investigator Bruce Curcio told the Journal News it appears the ambulance driver was not at fault.

Carmel Fire Chief Daryl Johnson says Lamb was taken off the support ambulance on Thursday at the Westchester County Medical Center.

The ambulance driver was not injured.



- ### Outline
- I. Review of data on ambulance crashes and safety standards and guidelines that exist for the ambulance transport
 - II. Identification of EMS transport safety issues, hazards and areas of risk to patients, providers and public
 - III. Highlight unacceptable mythology and challenges to advancing EMS transport safety
 - IV. Profile innovation, new safety technologies and strategies and knowledge transfer to enhance safety and reduce risks of ambulance transport



Monday, January 28, 2008 10:14 am

1 dead, others injured in Sussex crash involving ambulance

Collision happened at the intersection of Beaver Dam and Indian Mission roads near Argyle Church.



April 13th....

EMS workers struck by car at scene of an accident - New Jersey

A paramedic and an EMT were struck by a car while working at the scene of an accident this morning in Cherry Hill, according to officials.

The paramedic and EMT, both from the Cherry Hill Fire Department, were working at the scene of a four-car accident in the westbound lanes of Route 70 around 9:00 a.m., officials said.

EMS personnel were busy loading a patient into the back of an ambulance when a vehicle struck them from behind, officials said.

With traffic on Route 70 backed up after the initial accident, the driver of the vehicle turned onto the shoulder and hit the paramedic and EMT, authorities said.

The EMS workers were taken to Virtus West Jersey Hospital and were being treated for non-life threatening injuries, authorities said.

Five people involved in the initial accident were taken to area hospitals, officials said.

The Cherry Hill Police Department will continue to investigate.

April 14th, 2008

Ambulance worker loses arm in accident - West Nyack, New York

An emergency services worker lost her right arm today after the ambulance in which she was a passenger crashed into a truck parked along Route 59 near the River to the Palisades Center mall.

Suzanne Ames, 20, was taken by helicopter to the Westchester Medical Center in Valhalla where she underwent surgery.

"She's out of danger, but she lost her arm," Raymond Florida, director of Rockland Paramedic Services said early this evening.

"We used multiple units from the jaws of life to extricate her," West Nyack Fire Chief George Drescher said. "She appeared to be seriously injured."

The paramedic van driver, 19-year-old Scott Thorne of Westchester Medical Center, said

April 20, 2008..??

HERALD EXPLORER

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State News

Child injured after being struck by ambulance

Byline: April 20, 2008 9:49 AM EDT

SPRINGFIELD, N.J. (AP) — Springfield police say a 7-year-old child in hospital with life-threatening injuries after being struck by an ambulance.

Police spokesman Kevin Shuster said the unidentified child was riding a bicycle about 9:30 a.m. Saturday when the ambulance struck him, according to News 12.com.

After treatment at the scene, the child was loaded into the ambulance and taken to St. Luke's Hospital, a hospital spokeswoman said. Her name will not be released at the emergency room until later.

Springfield boy hit by ambulance dies

Byline: April 22, 2008 8:33 PM EDT

SPRINGFIELD, N.J. (AP) — A 7-year-old boy has died after being struck by an ambulance while riding his bike over the weekend.

Thomas M. Stenwick was pronounced dead at 8:27 a.m. Monday morning at St. Luke Children's Hospital, the Springfield State Journal Register reported on its Web site. An ambulance with the St. Luke medical examiner's office took a case of death, but not yet been determined.

May 19th, 2008

Girl On Way to School Struck By Ambulance - New York

A 13-year-old girl was in serious condition Monday after being hit by an ambulance in the Midwood section of Brooklyn.

She had earlier been reported dead.

School officials said the teenager, a student at Public School 99, was walking to school around 8 a.m. when she was hit at Coney Island Avenue and Avenue K. The ambulance was responding to a call at the time of the crash.

A crossing guard said that the ambulance approached with its lights and siren on while the girl was crossing the street. After she was struck, ambulance workers put the girl in the ambulance and took her to the hospital, the crossing guard said.

The ambulance was from New York Presbyterian Hospital.

Firstly!

▶ An accident ?

▶ or

a predictable and preventable event

**Clinical Care?
Occupational Health and
Safety.....?**

▶ **This IS a Transportation and Automotive Safety issue**

▶ **This is a Systems safety issue**

USA 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

Transport oversight?

- ▶ In contrast to the bus and truck industries, which have -
 - comprehensive safety oversight
 - transportation safety interventions
 - transportation safety data capture via the Federal Motor Carrier Safety Administration (FMCSA)
- ▶ EMS has been focused more as an acute health care delivery and emergency medical service and largely outside of much of the other transportation oversight infrastructure that exists

2 counts of vehicular homicide... November 5, 2007 - PA

Drunken ambulance driver killed 2 in car crash - Pennsylvania

A 22-year-old ambulance driver drank before her shift and was impaired when she collided with a car in Marshall, killing two men instantly, Allegheny County District Attorney Stephen A. Zappala Jr. said today.

Shanea Leigh Climo, 22, of Evans City, is charged with two counts of homicide by vehicle and involuntary manslaughter, driving under the influence and several traffic offenses in the Sept. 23 collision at Perry Highway and Brush Creek Road. She was arrested the morning, arraigned and released on her own recognizance, authorities said.

Police said an on-board camera system in the ambulance helped them decide to file charges. The camera allegedly shows the face of the driver, Shanea Climo.

Zappala said Climo was traveling south on Route 19, transporting a patient with a do-not-resuscitate order to UPMC Passavant, when she ran a red light and hit a Chevrolet Cavalier driven by Douglas Stott. Stott and a passenger, Philip Bacon, were killed.

The patient later died, but his death was not believed to be related to the crash, Zappala said.

An interhospital transport ? "Do no harm...?"

Date Reported: Tuesday, January 15, 2013 12:02

61246947 | [Read the Article](#) | [Upload Article to eScribd](#) | 

Pa. ambulance involved in crash; patient pronounced dead at scene

By Elizabeth P. Hunt
The York Dispatch (Pennsylvania)
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An Adams County ambulance making a patient transfer to York Hospital collided with a car at the intersection of routes 20 and 210 in West Manchester Township at 9:47 this morning, and the patient was pronounced dead at the scene.

York County Deputy Coroner Claude Stibbey told the patient, a woman, was being transported from Southbury Hospital to York Hospital for a "significant" heart condition.

The van had 1000 lbs. on the back and whether the van was fully loaded or not is still under investigation, Stibbey said. He said the van was involved in a fatal crash because it was not properly secured. Stibbey said the patient was pronounced dead at the scene.

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

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



Absence of standards and oversight

- ▶ Challenges in identifying best practice
- ▶ Myriad of unregulated commercial products
- ▶ No safety performance standards
- ▶ Absent national safety oversight

- ▶ What we need to consider, where is the 'bang for buck' in ambulance transport safety:

Challenges to Optimizing EMS Transport Safety

- ▶ Disparate and fragmented safety infrastructure
- ▶ Lack of a centralized EMS Safety oversight or data
- ▶ A large number of small groups of end users, with a mix of volunteers and professionals
- ▶ Ambulances are hybrid non-standard vehicles, a truck chassis and an after market box or a modified van
- ▶ EMS vehicle safety is not integrated as a part of the transport safety industry

1960 to 2007



A passenger vehicle - sure

A 'laundry or mail truck' - ?

A passenger vehicle - yes!

Some odd facts

- ▶ Ambulances are generally not built by the automotive industry
- ▶ Intelligent Transportation Systems (ITS), transportation safety engineering is not generally integrated into EMS systems
- ▶ Although all EMS systems have medical direction and oversight, it is rare for there to be transportation expertise oversight

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

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

TIME
&
PLACE

The Emergency Department (ED)



An ambulance is not an ED /ICU on wheels




National EMS data

In the USA*

- ▶ ~ 50,000 vehicles
- ▶ ~ 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

*PARIS/ITS/2005-6

Is it your service's tragic year?

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

Predictable risks

- Fatal crashes more often at intersections, & with another vehicle ($p < 0.001$)*
- 70% of fatal crashes EMS crashes during Emergency Use*
- 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#
- More likely to crash at an intersection with traffic lights (37% vs 18% $p=0.001$) & more people & injuries/crash than similar sized vehicles#

*John CA, Pirabho RB, Kuhn EM. *Prehosp Emerg Care* 2007 Jul-Sep;15(3):281-9
 **Dillon, Zelenka, Lewis, L. *BMJ: Res Post* 2002
 ***Maguire, Hunting, Smith, Leveck, *Annals Emerg Med* Dec 2002
 #ROJEM, 2002
 #Safety AM, *Prehosp Emerg Care* 2002 Dec; 9:412-416

'Workplace' Hazards



and what is killing EMS ?

EMS personnel fatalities*

- 74% transportation related
 - 1/5 of ground transport fatalities were struck by moving vehicles
- 11% were cardiovascular
- 9% were homicide
- 4% needle sticks, electrocution, drowning and other

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

'Real world' head-on post crash



What are the solutions?

- Training?
- Practice Policy?
- Transportation Systems Engineering?
- Automotive Engineering?
- Education of other road users???

The Driver

- Driver selection
- Driver monitoring and feedback
- Driver Impairment
- Driver training

Driver issues

Journal of Emergency Medical Services, Volume 15, Number 10, October 2000

The Relationship Between Satisfaction of Factors and Emergency Medical Technicians' Age
 Jonathan R. Stubbek and Eric Patten
 The University of Tennessee Medical Center, Knoxville, TN, USA; New York University, New York, NY, USA

Abstract: The purpose of this study was to determine the relationship between satisfaction of factors and emergency medical technicians' (EMTs) age. The study was conducted in a hospital emergency department. The study included 100 EMTs who were surveyed about their satisfaction with various factors. The results showed that younger EMTs were more satisfied with various factors than older EMTs. The study also found that younger EMTs were more likely to be involved in accidents than older EMTs.

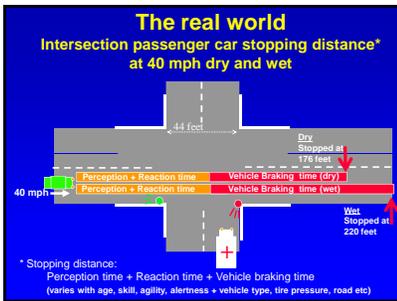
Conclusions: When controlling for call volume and ambulance time, the odds of having been in an ambulance accident within the past year were significantly higher for younger EMTs. Future studies should investigate the effects of various interventions such as increased field supervision or driver safety training programs on the driving performance of younger EMTs.

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.....



Policy makes a difference...

Journal of Emergency Medical Services, Volume 15, Number 10, October 2000

Organizational policy and other factors associated with emergency medical technicians' work habits
 Jonathan R. Stubbek** and Amy Forbeck*

Abstract: The purpose of this study was to determine factors associated with work habits among emergency medical technicians (EMTs). The study was conducted in a hospital emergency department. The study included 100 EMTs who were surveyed about their work habits. The results showed that organizational policy and other factors were associated with work habits. The study also found that EMTs who worked in hospitals with organizational policies were more likely to have better work habits than those who did not.



NAEMT July 2006 Position statement

National Association of Emergency Medical Technicians Statement on Safety Restraint Use in Emergency Medical Services

Background: Emergency Medical Services (EMS) throughout the nation has been shown to be a dangerous profession. Although there is limited data to clearly define the inherent risk of performing the job, statistics show that EMS is a generally accepted to be the most hazardous line of work of a profession in the United States. It is the responsibility of the National Association of Emergency Medical Technicians (NAEMT) to ensure the safety of its members and the public. This position statement is intended to provide guidance to EMS agencies and organizations on the use of safety restraint equipment.

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

Dynamic Safety Testing

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

The Crash Event - Crash Testing

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

Intrusion vs Deceleration

- ▶ Intrusion
= vehicle to vehicle or vehicle to fixed narrow object
- ▶ Deceleration
= sudden stop – ie. sled test

If we know this – and its published...



Lewis NR, et al. Development and Application of a Dynamic Testing Procedure for Ambulance Pediatric Restraint Systems, SAE Australasia 1998:58:2:45-51

Why do we do this?

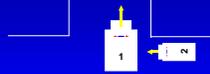


in a collision at 35 mph (60 km/hr), an unrestrained 15 kg child is exposed to the same forces* as in falling from a 4th story window

*550 kg/force in 0.03 sec

Full Vehicle Crash Testing

Test 1 – Right side impact



1 - Target vehicle
Type I ambulance
2 - Barrier vehicle
Type II ambulance
Closing speed 44 mph



And this all takes place in 60 milliseconds
– the blink of an eye



Choose the Best Option

Immobilization board



Foldable



A few key words about restraint systems...

NOT new technical data...



Richardson S.A., et al, *Int. J. of Crash*, 4:3, 239 – 259, 1999
Side facing 4-point harnesses demonstrated to be lethal, even at slow ground vehicle speeds

'Safety' approaches being driven by manufacturers claims and sales rather than by science and data



Dangerous failures of both occupant protection and systems engineering



Yes, the ride of your life....

- ▶ Sure... these vehicles all parade around the EMS and Fire shows BUT...
- ▶ NOT ONE of these vehicles has been to the automotive safety shows or scrutinized by the automotive safety industry

What you can do now

- ▶ Have a written and implemented 'safety program'
- ▶ Secure all equipment
- ▶ Secure occupants with standard belts
- ▶ Don't drive through red lights/stop signs
- ▶ Use properly implemented "Feedback Boxes"
- ▶ Monitor crash events with common denominators (ie. per 100,000 miles and per trip)

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'**

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

Conclusions

- ▶ Prevention is key - The pediatric ambulance transport environment includes predictable and preventable occupant risks.
- ▶ Unrestrained occupants and equipment are a potential injury risk to all occupants
- ▶ Every member of a pediatric 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
- ▶ Safer patient transport practices exist & should be used
- ▶ 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

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

Thank you! Any Questions??

an electronic recording and a .pdf handout of this presentation awaits you online

www.objectivesafety.net

