

Oklahoma Native American EMS Association, ONAEMSS
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EMS Transport - New Trends in Ambulance Safety

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

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

- ### Outline
- I. Review of data on ambulance crashes and safety standards and guidelines that exist for the ground EMS
 - II. Identification of ground 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 ground EMS and patient transport

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.....

Interactive handout

<http://www.objectivesafety.net>

- ### Emergency Medical Service Transport
- What are the transport safety issues that pertain to this important public service and public safety industry?
 - What do we know of the risks and hazards and how can we measure these ?
 - How can the safety of this transport system be optimized?



....May 21st, 2007, Seattle

KOMOTV.COM

EMT seriously injured in crash on I-5

Seattle — An emergency medical technician was seriously injured early Sunday morning when he was struck by a pickup truck on Interstate 5.

The State Patrol says it was around 10 p.m. when a blue pickup ambulance was on an I-5 crash near Boeing Field. David Marston, who was driving the ambulance, pulled over to the right shoulder and got out to get up the truck.

A speeding truck 2 miles along and headed into traffic, then crashed into the ambulance. The impact pushed the ambulance toward another 3 feet, nearly

....May 25th 2007?

Original Message
Subject: Feasibility for an EMS Workforce Safety and Health Surveillance System - Information from NHTSA Office of EMS
Date: Fri, 25 May 2007 16:42:14 AM
From: Chris.Zetser@dot.gov

Dear EMS Stakeholders,

The National Highway Traffic Safety Administration (NHTSA), Office of Emergency Medical Services (EMS) is pleased to announce publication of a report for an EMS Workforce Safety and Health Surveillance System. This is the first report of a study funded by NHTSA's Office of Emergency Medical Services (EMS) and conducted in collaboration with Federal and National EMS stakeholder organizations. This report documents the study and possible solutions to reducing national occupational morbidity of EMS workers against all diseases.

This feasibility study serves as a valuable supplement to ongoing national EMS workforce research. NHTSA continues to expand research efforts in Federal EMS workforce, NHTSA, and the Health Resources and Services Administration (HRSA) EMS for Children (EMS-C) program are established with the national EMS community as the EMS Workforce for the 21st Century program, managed by the University of California San Francisco (UCSF).

Help is on the way ??? November 24th 2008



Some odd facts

- ▶ Ambulances are generally not built by the automotive industry
- ▶ Intelligent Transportation Systems (ITS), transportation safety engineering and transport systems engineering are 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



What do ambulance crashes really cost ?

- ▶ Loss of life and injury
- ▶ Negative impact on EMS system
- ▶ Collisions are the largest liability cost and exceeds malpractice or negligence
- ▶ Besides the direct financial costs of replacing a damaged ambulance and equipment, there are additional hidden costs incurred:
 - investigating the ambulance collision
 - litigation /settlement/lawsuit
 - medical/disability costs of injured EMTs
 - hiring of new employees to replace injured personnel
 - retraining and psychological counseling of personnel involved and others
 - increased insurance rates



This month....



A few weeks ago



Last month....



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
 - Captains chair
 - Standing or kneeling



View of Ambulance interior from Rear

The 'workplace' is also a crash scene



USA EMS

- ▶ EMS Systems - >15,000
- ▶ Personnel - ~1 million (~30% 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

Safety oversight of what and by whom

- ▶ Vehicle Safety
- ▶ Vehicle Design
- ▶ Transportation systems safety
- ▶ Safety Equipment Design
- ▶ Vehicle and Safety Equipment Testing and Standard development
- ▶ Safety policies

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 ?

A Simple Question....

A Simple Question
Nathan Levin, MD, MPH

Why have all these recent incidents... ask a simple question: "Were those 14... value than the approximately 14 lives..."

What are the solutions?

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

Knowledge Transfer ?

TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES

Active Projects

(all due 2007)

- ▶ 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

1960 to 2007



A passenger vehicle - sure



A 'laundry or mail truck' - ?



A passenger vehicle - yes!

We've known for 10 years that red fire trucks are twice as likely as lime yellow trucks to crash at an intersection

Fire Trucks Are Supposed To Be Red, Right? Not If You Want To Reduce Accidents

Picture a fire truck and you are likely to see red - fire engine red. But when it comes to safety, human factors and ergonomics research paints a different picture.

Researchers (Stephen themselves) were awarded accident data from the City of Dallas started with white upper cabs vehicles with white cabs and King found that there as much as three times

lime-yellow/white pump emergency vehicles or damage is less than a study by Solomon into lime-yellow fire pump intersection accidents.

Lime-Yellow Fire Trucks Safer Than Red - A Conclusion from Four Years of Data

Chronic emergency vehicles-red fire engines-may be more dangerous for the public and fire firefighters than lime-yellow fire engines. Tabulation and review of data from Dallas, Texas produced the following conclusions:

If other factors are the same, the probability of a visibility-related accident for a red or red/white pumper is greater than the probability for a lime-yellow/white pumper. . . . Lime-yellow/white fire pumpers are significantly statistically safer than red and red/white fire pumpers.

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

'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



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???

A problem

2007 Insurance data –

- ▶ 27 fold more likely to have a claim based on transport than related to medical care

Goals

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

EMS Best Practice, Sept 2006

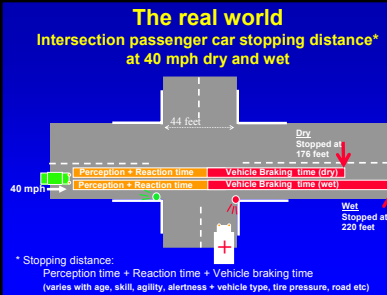


And very Predictable...

- ▶ 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.....



Global EMS Standards

- ▶ Australia & New Zealand ASA 4535
- ▶ Common European Community EN1789
- ▶ 'USA KKK & NTEA – AMD'
- ▶ [Aviation - FAA/CAA/JAA]
- ▶ CAMTS
- ▶ CAAS
- ▶ International Joint Commission on Medical Transport
- ▶ ANSI/ASSE Z15

Innovation

This months JEMS

AMBULANCE SAFETY FIRST

Experts convene to discuss
ambulance & patient safety issues

suggested looking to other related industries for the answer to safety issues. "We are grappling with issues that the automotive industry has already studied, has data [on], and knows only too well," said audience member Nadine Leveck, MD, MPH, executive director of Objective Safety LLC.

Leveck noted that ambulances are designed outside of the automotive industry and not tested for crashworthiness, "making them more than twice as lethal as large trucks." She was especially concerned about the seating arrangements inside the ambulance. "There's no justification for a sideways-facing seat in a forward-moving vehicle," she said.

Safety at the scene



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



Full Vehicle Crash Tests

Test 1 – Right side impact



- 1 - Target vehicle, Type II ambulance
- 2 - Bulbar vehicle, Type II ambulance

Test 2- Frontal



- 1 - Bulbar vehicle, Type II ambulance
- 2 - Target vehicle, Type II ambulance



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



Vehicle Occupant Safety design

2007 European design
Safety technology is a key focus



Ergonomic design



Ergonomic layout and equipment



Policy Changes

CPR?

EMSNetwork

The onset of this advanced knowledge, training and skills drastically reduced the necessity for the ambulance to "hurry" back to the hospital. Highly skilled care can now be rendered immediately upon the crews' arrival at the patients' side and remain uninterrupted until arrival at the emergency department. The days of needing to travel 60-100 mph to "travel" the patient are now gone, at least it should be. Studies time and time again confirm that CPR is best performed in the ambulance at speeds of 25 mph or less. While we are on the issue of CPR, statistics have shown that survival rates (patient walks out of the hospital) for "out-of-hospital" CPR is less than 2%. There are very, very few instances now when CPR should be performed in a speeding ambulance. Prolonged CPR in an ambulance is CONTRAINDICATED (should NOT be performed), due to the risks involved for the crew. An older, very wise ER doctor once told me, "Tom, dead is dead", and I can't argue that point.

New Australian vehicles



UK Ambulance vehicles





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?

Driver behavior monitoring and feedback device

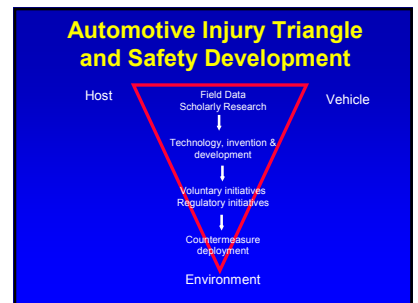
Levick NR, Swanson J, Proceedings - 49th Annual Conf. of the Assoc. for the Advancement of Automotive Med, September 2005
AMBEX-999 Research Forum 2006 – Research most likely to change practice award

The “Black Box” - A transportation safety monitoring and feedback device

This technology is conceptually like a vehicle safety 'pulse oximeter' – that with auditory feedback - can save your life, your coworkers life, your patients life, and others on the road

Demonstrated Effectiveness

I – blind data, no grows
 II – grows & tones ON unidentified data capture
 III – identified data



Protective devices/concepts

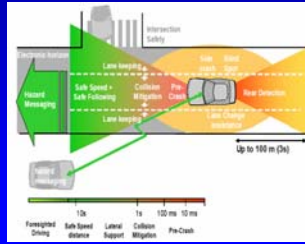
To prevent a crash

- ▶ Driver feedback
- ▶ Driver monitoring
- ▶ Driver training
- ▶ Vehicle Intelligent Transportation System (ITS) technologies
- ▶ Tiered dispatch
- ▶ Appropriate policies

In the event of a crash

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

Intelligent Transport Safety Systems



Vehicle visibility and conspicuity



The difference having data makes?



Protective Equipment



Integration and Collaboration

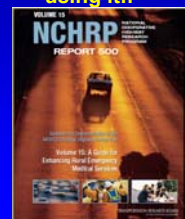
EMS Transport Safety Strategies - 2006-2007 New York State Strategic Highway Safety Plan



Tips for Emergency Vehicle Operations



Transportation Research Board is an excellent resource... we should be using it!



No need to reinvent the wheel...



USFA Emergency Vehicle Safety Initiative



March 2007 - FHWA



An excellent model



<http://www.EveryoneGoesHome.com>

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



Vehicle design and safety

- ▶ The principles of automotive safety involve a complex science, engineering technical skill, expertise, training and knowledge
- ▶ "Give the engineers a working list of our needs and let them tell us how it should be built to accomplish those tasks....."
John Russell MD, Advisory Panel, EMS Safety Foundation, 2007

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 sidefacing 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

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
- ▶ Development of substantive EMS safety standards is a necessity and a reality
- ▶ Multidisciplinary safety issue that EMS cannot solve internally
- ▶ Failure to transfer knowledge from transportation and automotive safety is unacceptable and dangerous
- ▶ EMS is still way behind the state of the art in vehicle, transportation and occupational safety

And....

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

Thank you!
Any Questions??
 Electronic handout available online
<http://www.objectivesafety.net>