

National Association of EMS Physicians
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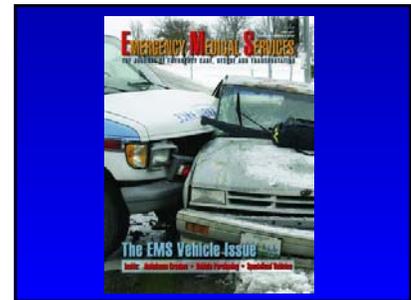
New initiatives in EMS Transport Safety: Where is the State-of-the-Art?

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This morning's Scope

- ▶ **Key Issues**
 - Crash and Safety Data
 - Oversight
- ▶ **Guidelines – standards**
 - Existing plus Draft '21'
- ▶ **Transport safety management**
 - Protective devices/programs
 - In the event of a crash
 - To prevent a crash
 - Safety Culture
- ▶ **Future**
 - Goals
 - New Safety Seminar
 - New vehicles
 - New technologies
 - Futuristic vehicles
 - New policies
 - New practices
 - New Standards



A tragic emergency health care intervention outcome



Emergency crew find one of their own killed in crash

Rollover Crash Kills Medical Technician
Ambulance Crew Off-Highway and Ends-Over Sparing Two Engineers and a Patient

It does happen....

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

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** - ~30 million patients
- ▶ **Cost** - ~\$5 Billion annually
- ▶ **Safety Oversight** - ? Disparate

Safety oversight of what and by whom

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

Ideally Who, What and Where ?

- ▶ **Occupational Health and Safety**
 - Epidemiology, Bio/Chem Hazards and Ergonomics
 - Regulation and Research
- ▶ **Automotive Safety**
 - Epidemiology, Engineering and Impact Biomechanics
 - Regulation and Research
- ▶ **EMS Industry**
 - Occ. Health, Automotive, Technical, Clinical & Fiscal data
 - Practice Policy, Risk Management and Fleet Safety
- ▶ **Academia**
 - Independent and collaborative
 - R & D and evaluation of all of the above

Goals

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



- ### Auerbach, JAMA 1987
- ▶ Passenger restraints for both ambulance attendants and passengers should be mandatory
 - ▶ Traffic signals should be strictly heeded at intersections and speed limits in urban settings be obeyed.
 - ▶ The mean delay to hospital care after an EMS crash was 9.4 minutes

We should use the best safety practices demonstrated

- ### 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??

Balance of concerns and risk during transport

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

Firstly!

▶ **An accident ?**

▶ or

▶ a predictable and preventable event

- ### "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
 - ▶ But..
 - ▶ There is NO way humanly possible that they could stop.....





This is where automotive safety is happening – where is EMS???

Enhanced Safety of Vehicles (ESV) – The Definitive Vehicle Safety Forum

Ambulance vehicle safety has only been presented at one ESV meeting, the 17th ESV in 2001

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

Global EMS Standards

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

This is happening out there NOW....

Is a license enough for ambulance drivers?

Extent of EMT training questioned by witnesses

By DAVID BOGUE
Miami Herald Staff Writer

Monday Herald Staff Writer, Aug. 1, 2005

Gregg Theune

Gregg Theune, a crash victim's husband, on Tuesday.

64 It's no different than someone who drives pizzas.

Gregg Theunes Appeal to his Senator, December 29, 2005

Failure in EMS Response Procedures Contributes to Deaths

QUESTIONS

- 1. How many ambulances are there in the state?
- 2. How many EMTs are there in the state?
- 3. How many paramedics are there in the state?
- 4. How many ambulances are there in the state?
- 5. How many EMTs are there in the state?
- 6. How many paramedics are there in the state?
- 7. How many ambulances are there in the state?
- 8. How many EMTs are there in the state?
- 9. How many paramedics are there in the state?
- 10. How many ambulances are there in the state?

ANSWERS

- 1. 1,000
- 2. 10,000
- 3. 5,000
- 4. 1,000
- 5. 10,000
- 6. 5,000
- 7. 1,000
- 8. 10,000
- 9. 5,000
- 10. 1,000

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

The 'workplace' IS a vehicle

- ▶ Providers often in vulnerable positions during transport.
 - Bench seat
 - Captains chair
 - Standing or kneeling

Captain's chair
Bench Seat
Stretcher
View of Ambulance interior from Rear

Hazards



Rollover Crash Kills Medical Technician
Ambulance Flips Off I-66 and Rollover, Injuring Two Employees and a Patient

By Tom Moran
 An ambulance carrying a patient and two employees rolled over on Interstate 66 on Tuesday, killing one of the employees and injuring the other employee and the patient.

The ambulance, a 2007 Ford ambulance, was traveling southbound on Interstate 66 near the intersection of Interstate 495 and Interstate 66. The ambulance rolled over onto its side, and the driver, a 32-year-old male, was killed. The other employee, a 30-year-old female, was injured and taken to a hospital. The patient, a 65-year-old male, was also injured and taken to a hospital.

The Virginia Department of Transportation (VDOT) is investigating the crash. VDOT officials say the ambulance was traveling at a speed of 60 to 70 miles per hour at the time of the crash. The ambulance was carrying a patient on a stretcher and two employees. The ambulance was carrying a patient on a stretcher and two employees.

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



The difference having data makes?

Head protection developments

- ▶ Head protection is an accepted, standard and standardized aspect of PPE for all Emergency Services, except for ground EMS personnel
- ▶ In a setting of new enhancements to ambulance transport safety – and a realistic understanding of time frames for such changes to fleet vehicles – head protection is a simple and cost effective initiative
- ▶ As a result of this study a collaborative relationship has been established with International Safety Equipment Association (ISEA) to support the development of a standard for ground EMS head protection

Crash Prevention

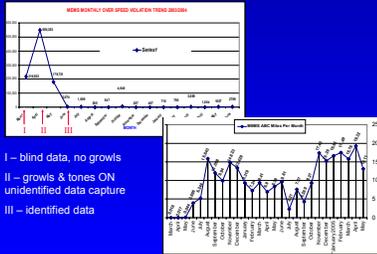
- ▶ EVOC
- ▶ Tiered Dispatch
- ▶ The “Black Box”
- ▶ Intelligent vehicle design
- ▶ Appropriate policy

The “Black Box”
 Driver behavior monitoring and feedback device

How to install the new device (enhancement of emergency medical services driver)?

The device is a small, black, rectangular unit that is installed in the driver's footwell area of the ambulance. It is connected to the vehicle's electrical system and records data on driver behavior, such as speed, acceleration, and braking. The data is then used to provide feedback to the driver and to identify areas for improvement in driver training and vehicle design.

Demonstrated Effectiveness



Improved safety, performance and decreased costs

- ▶ No increase in response times
- ▶ Pays for itself in 6 months in reduced maintenance costs alone
- ▶ Improved safety proxies by orders of magnitude and sustained with no in-service
- ▶ Reduced crash rate by up to 90%
- ▶ Well accepted
- ▶ Is it ethical NOT to have these devices in all vehicles now?

Other monitoring devices

- ▶ Primarily to record events during and immediately preceding a crash
- ▶ Give no driver crash prevention feedback
- ▶ Administratively burdensome
- ▶ Intrusive
- ▶ Not demonstrated to be as effective in improving vehicle maintenance costs or as effective in modifying driver behavior long term

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

Creating a Safety Culture

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

- ▶ Awareness
- ▶ Training
- ▶ Incentive

USA EMS Risk/Hazards

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

Multidisciplinary collaboration and the way forward

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

Automotive Safety PPE

- ▶ Automotive restraint in the EMS environment IS a specialized form of PPE
- ▶ Ergonomic or Occupational Health and Safety expertise is key to workplace safety – but is outside of expertise with a history of automotive crash safety or vehicle/restraint safety testing
- ▶ The automotive safety industry is THE industry where the safety of devices that are for the protection of occupants in a moving vehicle, are best evaluated

Other Devices

- ▶ In both the military and the automotive industry being ambulant in a moving vehicle or crash, in any device, is a dangerous practice and is not supported
- ▶ Use of current 'seated' crash dummies to demonstrate that such ambulatory devices may be safe is a fallacy, and misleading
- ▶ Peer review at ESV (Enhanced Safety of Vehicles)!

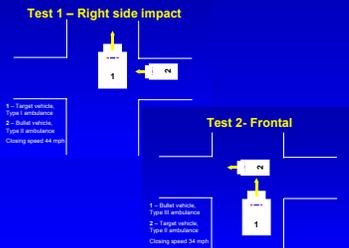
The Crash Event - Crash Testing

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

The right test for the desired outcome

- ▶ Protecting the vehicle alone may not protect the occupants
- ▶ Crash tests using crash test pulses not specific to ambulance vehicles may give misleading results
- ▶ Crash tests of restraint or other equipment using crash dummies not designed for that purpose, may give misleading results, or worse - may suggest that a dangerous or unsafe device may be safe

Full Vehicle Crash Tests - 2000



Updated: Wednesday, Mar 14 - 2:10 PM
Florida - News - News

Florida - News - News

Florida Ambulance Hit Head-on

HEATHER CASEY
Firehouse.Com News

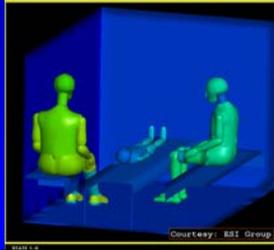
Two Florida paramedics were seriously injured and another person is dead after an early morning crash between an ambulance and a Nissan car.

Just before 2:30 a.m. Wednesday, a car heading east on I-4 crossed the median and struck a Highlands County EMS ambulance head-on, according to Highlands County PIO Lisa Burley.

Courtesy: Orange County Fire Department



Computer Simulation



Safety Enhancements Being Implemented

- ▶ EVOC
- ▶ Tiered dispatch
- ▶ Monitoring & Feedback devices
- ▶ Helmets
- ▶ Optimized ambulance vehicle design
- ▶ New Standards

New Industry Initiatives

- ▶ Development of an industry based task force –
 - MMTS, Mobile Medical Transportation Safety Task Force, established January 2003.
 - First multidisciplinary symposium held in DC, November 2003
- ▶ AMR Concept vehicle on display at EMS Expo 2004 & 2005
- ▶ Planned AAA symposium Spring 2006

USA design initiatives



New Swedish vehicles



New Australian vehicles



New UK London Ambulance/neonatal vehicles



Other successful models



The right vehicle for the environment?

- Not a good day for golf



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?

A glimpse of the future



EMS Transport Safety

Policy that Reflects
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

**PREDICTABLE
PREVENTABLE
and
NO ACCIDENT**

Future Directions

- ▶ Rational use of limited resource
- ▶ Avoid reinventing the wheel
- ▶ Formal safety research agenda
- ▶ Framework bridging key research and infrastructure
 - Society of Automotive Engineers
 - Involvement with ESV activities
 - EMS safety research funding
 - Foster evidence based initiatives

Conclusion

- ▶ Major advances in EMS transport 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 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

Electronic Info:

www.objectivesafety.net

- ▶ 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



Acknowledgements

- ▶ EMSC funding -Targeted Issues Grant, PED-SAFE-T
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