AMBULANCE SAFETY
So what’s new…?

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What’s new
- New expertise and collaborations
- New automotive and safety technologies
- New Information
- New events

New expertise and collaborations
- TRB
- ASSE
- OSHA
- SAE
- UTRC
- Ergonomics
- Industrial Design

Regional University Transportation Research Centers

New automotive and safety technologies
- crashworthiness
- EVS
- ITS
- Monitoring and feedback enhancements

New Information
- ESV
- ASSE
- OSHA best practices
- KKK-F Public Comments
- Worker visibility Act
- SAFET-LU
- State Strategic Highway Safety Plans
- State EMS Council Policies

New Events
- OSHA best practices panel 06-07
- ASSE PDC, June 06 & 07
- TRB EMS Transport Safety, 07 & 08
- EMS Today ‘panel’, 07
- KKK-F Auto safety Public Comments
- State EMS Council, Safety subcommittees
- Safety Summit? 08

EMS Today.. ‘expert panel’
What do ambulance crashes really cost?

- Loss of life and injury
- Negative impact on EMS system
- Collisions are the largest liability cost and exceed 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

June 2007

A problem

2007 Insurance data –

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

Is it your services tragic year?

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

Key Elements to Safety

- Data Capture
- Vehicle Biomechanics and Crashworthiness
- Ergonomics and Biohazards
- Transportation Environment
- Safety Management – evaluation and analysis

What are the solutions?

- Training?
- Practice Policy?
- Transportation Systems Engineering?
- Automotive Engineering?
- Education of other road users???
What's missing
1. What data is collected nationally?
   - We have no denominator data
   - We have incomplete numerator data
2. Absent population based national injury data or injury mechanics data
3. Absent structured transportation safety engineering input
   - 1 x 2 x 3 = resultant inability to design and evaluate efficacy of injury interventions
4. What oversight is there?
5. Which organizations would determine policy?

Balance of concerns and risk during transport
- Response and transport time
- Clinical care provision
- Occupant safety/protection
- Public Safety

Transport related aspects of EMS
- dispatch of EMS vehicles
- transport policies and protocols
- vehicle fleets and vehicle design
- vehicle purchase standards
- Intelligent Transportation Systems technology
- driver training
- training simulation
- driver performance monitoring
- roadside and road design
- integrated traffic safety technologies
- driver safety and visibility
- safety data capture
- safety oversight

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…..

The real world
Intersection passenger car stopping distance* at 40 mph dry and wet

A peer reviewed tragedy
- Persistent disconnect between automotive safety science and EMS transport safety approach
- Pre-hospital and Emergency Care 2004
  - "EMS vehicle drivers are advised to approach the intersection, slowing to ensure that traffic has stopped and making eye contact with other drivers before entering the intersection."
- In the modern era of road safety to suggest that a strategy of "eye contact" to be made at an intersection with a driver travelling at ~40mph in the hope that this would result in a safety intervention, is at best frightening

An excellent model
http://www.everyonegoeshome.com

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NAEMT July 2006 Position statement
Policy makes a difference...

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

A very serious gap in data, performance and oversight

- FMCSA Truck safety goals – to decrease the fatality rate of 2.8 per 100 million truck-miles in 1996 to 1.65 by 2008
- EMS crash fatality rate estimates are – 7.66 - 41.93 fatalities per 100 million ambulance-miles

UPS and Laundry trucks have very similar design and even more stringent safety requirements to EMS vehicles BUT very different cargo……

People are passengers and NOT packages or parcels

Thursday July 5th 2007……

“Ambulance transport has a death toll…. ”
The ‘accident’ scenario…
- There were three personnel in the back of the ambulance plus the patient.
- The patient being treated had a self-inflicted laceration with an arterial bleed to an upper extremity.
- The ambulance was traveling lights and sirens and moving slowly through an intersection when they were involved in a T-bone collision.
- They were struck on the passenger side of the vehicle near the rear of the box.

At the time of the ‘accident’…
- The paramedic with the serious head injury was seated and un-restrained on the bench seat over the rear wheel well on the impact side of the vehicle.
- At the time of impact, the paramedic with the head injury had just finished starting an IV and he was discarding his needle in a wall mounted sharps container.
- A second Paramedic was standing at the head of the patient involved in an unknown activity. An EMT was standing near the front of the bench seat, holding direct pressure and elevating the patients arm upright.

The tip of the iceberg of the ‘accident’ outcome...
- The second paramedic and the EMT received minor soft tissue injuries only.
- The paramedic with the head injury was intubated for a short time and then extubated later that same evening.
- He is back to work after a couple of months off the job. He is not working as a paramedic yet, but he is back on the line as a chiefs aid until his doctor gives him permission to return to active duty status. He has been dealing with memory problems and the need to sleep for longer hours than normal.

Bigger is not necessarily better......

Occupant protection......??
July 2007

USA ambulance purchase specifications
- Static Pull test
- 2200 Lbs. (8G’s) in Longitudinal and Lateral
- No dynamic test
- No definition to manikin mass
- No restraint for equipment
- Voluntary

KKK – static ‘safety testing’
- Ignorant of automotive safety principles – and specifies -
  - No structural damage to any load bearing or supporting members, i.e., torn or broken material, broken welds, popped or sheared body rivets, bolts, and/or fasteners, shall be evident during the application of the force and after the release of the force.

Unacceptable current 2007 USA ambulance ‘safety testing’ practices !??

F = ma
where F – force
m – mass
a – acceleration
Bottom line

- The AMD should consider revising the standard comprehensively to reflect current accepted automotive safety practice, given the current vehicle crashworthiness and occupant protection knowledge and published literature.


- "Without exception, all persons, medical devices, equipment, and objects normally carried on the road ambulance shall be maintained to prevent them from becoming a projectile when subject to a force…"
- 50th percentile manikins - 10 G in Forward, Rearward, Transverse, & Vertical directions
- Certified by Notified Body and Ambulance Mfg.

USA Ambulances: FMVSS Exempt

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

Major events for innovation sharing – but regional and often language isolation.

Vehicle Occupant Safety design

2007 European design
Safety technology is a key focus.

Ergonomic design

Securing equipment

Ergonomic layout and equipment
Policy Changes

Safety leadership... from the IAFC and USFA

CPR?

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:
  
  \[ \text{Incident rate} = \frac{\text{Number of incidents}}{\text{Number of vehicles}} \times 100 \]

- Incident rate based on vehicle mileage:
  
  \[ \text{Incident rate} = \frac{\text{Number of incidents}}{\text{Vehicle mileage}} \times 1,000,000 \]

- Injury incident rate based on vehicle mileage:
  
  \[ \text{Injury incident rates, the most frequently used indicator of incident severity, are useful for tracking events that have the potential to affect financial or operational performance of the operating unit.} \]

\[ \text{Injury incident rate} = \frac{\text{Number of incidents with injury}}{\text{Vehicle mileage}} \times 1,000,000 \]

- Incident rates based on service activity:
  
  \[ \text{Incidents per 10,000 transports} = \frac{\text{Number of incidents}}{\text{Number of transports}} \times 10,000 \]

- Vehicle injury rates based on work hours:
  
  \[ \text{Vehicle incidents per 200,000 hours} = \frac{\text{Number of incidents}}{\text{Number of hours worked}} \times 200,000 \]

Legal Perspectives on Z.15

EMS Specific Z.15....

State Strategic Highway Safety Plans

http://www.objectivesafety.net/TransActions%20Z15.pdf

State Strategic Highway Safety Plans
Integration and Collaboration


- EMERGENCY MEDICAL SERVICES DISPATCH SERVICES
  - Increase the role of Regional EMS Councils in local and regional traffic safety boards and organizations

- EMERGENCY MEDICAL SERVICES PARTNERSHIPS
  - Increase the participation and role of Regional EMS Councils in local and regional highway safety boards and organizations

- PRE-HOSPITAL TRAINING PROGRAMS
  - Develop and implement a training program to provide education and training for EMS providers on the use of the new medical protocols

- ROAD CONDITION AND INCIDENT RESPONSE
  - Increase the participation and role of Regional EMS Councils in incident response programs

EMS RESPONDER CRASH PREVENTION

- Undertake a systematic review of other states’ actions and protocols on ambulance traffic safety measures to identify and prioritize those appropriate for the New York State pre-hospital system

- Increase education and awareness of EMS providers on traffic safety techniques

- Develop and implement a training program to provide education and training for EMS providers on the use of the new medical protocols

- Review pre-hospital protocols and protocols to identify those that may contribute to injuries resulting from the impact of ambulance crashes

- Identify methods to provide incentives for adoption by EMS services of protocols that enhance traffic safety

- Partner with organizations that provide public driver awareness and education campaigns to improve awareness of driver responsibility and appropriate responses to approaching emergency vehicles

EMS Best Practice, Sept 2006

News we don’t want to see

Caught On Video: EMT Struck By Car

.....May 21st, 2007, Seattle

.....May 25th, 2007?
Help is on the way ???
November 24th 2008

This looks cool AND SAFE!

Not rocket science..

New EMS helmet prototypes for 2006-2007

Problems

- No Standards
- Unique safety and hazard protection needs
- A number of less than appropriate devices out there

EMS has unique head protection needs – not well met by a ‘truncated’ fire helmet…

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???

It isn’t like this outside of the USA
Tiered Dispatch

Intelligent Transport Safety Systems

Back up Camera..... Shouldn't all vehicles have one of these?

The “Black Box”
Driver behavior monitoring and feedback device

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

Purpose of ‘Blacket box’ Program
- Enhance Safety
- Improve Driver Performance
- Save Maintenance Dollars
- Aid Accident / Incident Investigation

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

Data, but is it generalizable

Healthcare Safety
- Importance of safety as an organizational value
- Proactive approaches to safety management and leadership
- Prevention of accidents, injuries
- Presents authoritative data from OSHA, EPA, NFPA, NRC, and JCAHO
- EMS Transport Safety? – Not a mention

Sit Down for EMS Safety!

VFIS Summer 2006

Where is transport research?
FDNY a leader in safety

Ambulance Driver Safety - Australia

Fleet Driver Training...

Dynamics of Fleet Safety - NSC

Occupational transportation fatalities...

A few weeks ago....

http://www.objectivesafety.net

Ambulance Safety Research: A New Field

We should use the best safety practices demonstrated in engineering

WE HAVE A BIG PROBLEM HERE


A few weeks ago....

The Huntsville Times

Ambulance suit gets $3.1 million

Article headline: "Ambulance suit gets $3.1 million"
and in ergonomics

The first and only published scientific text on ambulance crashes (1995) …and by an optometrist

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

Science not, next best guess

Ambulance Safety Research: A New Field

DOT Funding for Reptiles and Road Kill

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

Rash of “Safety Concept” vehicles… Devoid of substantive automotive safety engineering input or testing

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 Rosatel 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 side-facing occupants are potentially lethal – and is in NO WAY SUPPORTED BY ANY DATA OR AUTOMOTIVE SAFETY EXPERTISE

PPE from the stationary environment can be highly hazardous in the automotive setting

Key Testing issues...

- In both the military and the automotive industry being ambulant in a moving ground 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

Were we safer in the Cadillac???

- Secure all equipment
- Secure occupants
- Don’t drive through red lights
- Use properly implemented “Black Boxes”
- Monitor crash events with common denominators (i.e. per 100,000 miles and per trip)
- Have a written and implemented ‘safety program’

Current fleet

- Vehicle design
- PPE
- Practice policy
- Data/Monitoring/Oversight

Future
Current and Future Research

- Epidemiology
- Ergonomic hazards
- PPE & Head protection (Bio/Chem/Radiation hazard)
- Transport
  - Vehicle/Occupant automotive testing
  - Vehicle design innovation
  - Driver behavior (Real time and Simulated)
  - Intelligent Transportation Systems
- Operations tracking
- Data systems/reporting systems
- Enhanced Practice policies evaluation

Conclusion

- New Infrastructure
- New information
- New collaborations
- New events
- Innovation in safety technologies, strategies and policy
- Knowledge transfer
- Unacceptable mythology
- Challenges to advancing EMS transport safety

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