So what is a Webinar?

A Webinar is:

- Real time interactive web technology
- No other hardware is necessary aside from a computer connected to the internet and a microphone - if you choose to speak
- These interactive seminars can also be stored for later asynchronous use

The EMS Safety Foundation

www.EMSSafetyFoundation.org

brings this presentation to you

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- Emergency Medicine Physician and Public Health Academic, (USA & Australia)
- Founder of EMS Safety Foundation
- Chair, National Academies Subcommittee TRB EMS Transport Safety, USA
- Recipient, International Society of Automotive Engineers, Women's Leadership Award for EMS Safety

Ambulance Transport Safety

- Emergency care, public health, public safety, and patient transportation.
- Important Principle: Ambulance transport safety is part of a system, the overall balance of risk involves the safety of all occupants and the public
- All get home safely

Your Interactive Handout awaits you online at...

www.objectivesafety.net

This WILL be FAST!!

No need to take any notes – all text slides will be awaiting you in your online Handout
Firstly!

➤ An accident?
➤ or
➤ a predictable and preventable event

A tragic emergency health care intervention outcome

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.....

A routine concept...

But Ambulance Safety is....

➤ ‘patient safety’
➤ AND also
➤ ‘provider’ and ‘public safety’
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

There are more safety standards for moving cattle than for moving patients in the USA

October 2008 JEMS Article “Rig Safety – 911”

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

The Emergency Department (ED)

An ambulance is not an ED / ICU on wheels
Is there an acceptable rate of morbidity and mortality for pre-hospital transport systems?

USA 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

Is it your service’s tragic year?

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

Safety - Why now?

- Operating optimally in a transportation environment that is largely devoid of specific safety standards for the hazards and risks present
- Bridge the gap between what technical information exists and what is accessible and applied to EMS

This is not a crashworthy environment
June 17th 2008
a paramedic and a patient killed

EMS CRASH KILLS PATIENT AND A SUFFOLK COUNTY (NY) PARAMEDIC IN THE LINE OF DUTY

Tuesday, June 17, 2008

We report to advise you that a female Suffolk County (NY) Paramedic was killed in the line of duty as she was a patient killed in a horrific crash involving an ambulance in Suffolk County (NY) Thursday. The single vehicle crash happened around 0245 hours on the John J. Pershing Highway in the Lake Ronkonkoma area of Suffolk County.

The Med Suffolk Rescue Squad ambulance was transporting to Bethpage Medical Center with a patient, 2 MSK5 Squad members and the Suffolk County Paramedic. As we head to a crash site of a crash that occurred at the side of the road on a county road near the Centerport-Rochester Junc. The patient was killed in the line of duty. Suffolk County EMS also suffered a loss last year when a Paramedic John Schott was killed in a crash when a civilian struck the Millennials Fire Company ambulance he was riding in.

October 31, 2008, Kentucky

April 30, 2009 - Tennessee

August 2009 – Impaired...
ONE KILLED, THREE INJURED IN TN AMBULANCE CRASH

Wednesday, September 16, 2009 - A fatal wreck occurred last night in Johnson County making a car, whose driver is suspected of being on drugs, and a rescue crew transport. The downside involved the car which is on Highway 87 and hit a Johnson County Rescue Squad ambulance. The flip pushed the ambulance off the road. It came back onto the road, but the ambulance's rear tire caught the edge, flipped over an embankment, and landed on its side. The report said that the driver of the car that hit the ambulance, 11-year-old James J. Buchanan was probably on drugs. The driver said that drugs may have been a factor in the crash so they’re treating this as a criminal investigation. We wish the rescue squad members a quick recovery.

An interhospital transport? “Do no harm...”?

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

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.
This IS a Transportation and Automotive Safety issue

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.
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.

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.

The ‘workplace’ IS a vehicle

- EMT’s often in vulnerable positions during transport.
  - Bench seat
  - Captain’s chair
  - Standing or kneeling

Absence of standards and oversight

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

“‘Ambulance transport has a death toll....’”

Carl Craigle EMT-P, Chief Platte Valley Ambulance
Nascar Safety Expert

- On ambulance patient compartment
  “It is a death vault”

Tom Gideon,
Head of Safety, GM Nascar

So for EMS personnel...

- What’s going to kill you?
- What’s going to injure you?

Ground Transport Safety IS
Complex AND Multidisciplinary

- Epidemiological Data Collection
- Risk Management
- Public Safety
- Transport Policy
- PPE
- Driver Training
- Fleet Safety Program

Art... ? Automotive Safety
Engineering surely

Research undertaken
Goals

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

Balance of concerns and risk during transport

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

Safety Management

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

The Crash Event - Crash Testing

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

Testing the real world
**Intrusion vs Deceleration**

- **Intrusion**
  - vehicle to vehicle or vehicle to fixed narrow object

- **Deceleration**
  - sudden stop – ie. sled test

**Dynamic Safety Testing**

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

**What is actually happening during an ambulance crash**

- Target vehicle, Type I ambulance
- Bullet vehicle, Type II ambulance
- Closing speed 44 mph
- And this all takes place in 60 millisecs – the blink of an eye
A few key words about restraint systems...

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

NOT new technical data...

Side facing 4-point harnesses demonstrated to be lethal, even at slow ground vehicle speeds

NOT new technical data...

Side facing 4-point harnesses demonstrated to be lethal, even at slow ground vehicle speeds
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

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??

Innovation

International approaches

- The state of the art non-USA vehicles have NO squad bench nor the after market structural vehicle modifications that can potentially decrease crashworthiness integrity that were seen in study vehicles.

EMS Safety Foundation Delegation bringing innovation to you
Vehicle Occupant Safety design
European design
Safety technology is a key focus

Safe and Ergonomic design

Flexibility to manage two patients

Important…
- Ergonomics and automotive safety issues are interrelated
- Crashworthiness priorities override the ergonomic issues
High speed crash, rolled and the occupants (patient and medics) had only minor scratches.

Safety first - Passive Safety

• A main feature in a front-end crash is the “disconnectable” front axle, which releases additional deformation zones in the longitudinal frame member when a particular force level is reached.
• On a frontal crash, transmission and engine will be pushed underneath front occupants.

Is safety crash tested by automotive experts

Unlike this vehicle

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?

Fleet Mix?
Safety concepts out there now

- Driver feedback technologies
- Tiered dispatch
- Enhanced ambulance vehicle design
- Intelligent Transport Technologies - ITS
- New Safety Standards

What about changing driver behavior in the real world??

AN OPTIMAL SOLUTION FOR ENHANCING AMBULANCE SAFETY: IMPLEMENTING A DRIVER PERFORMANCE FEEDBACK AND MONITORING DEVICE IN GROUND EMERGENCY MEDICAL SERVICE VEHICLES

Nadine R. Leveick, MD, MPH
Mammotrax Medical Center

REAL WORLD APPLICATION OF AN AFTERMARKET DRIVER HUMAN FACTORS REAL TIME MONITORING AND FEEDBACK DEVICE: AN EMERGENCY SERVICE PERSPECTIVE

Nadine Leveick
Mammotrax Safety LLC

Purpose of ‘Feedback box’ Program

- Enhance Safety
- Improve Driver Performance
- Save Maintenance Dollars
- Aid Accident / Incident Investigation

How the Device Works

- Computerized monitoring device installed on each vehicle to measure parameters
- Each driver has individual key “fob”
- Data collected every second
  - including: vehicle speed and performance, driver behaviors and emergency mode
- Auditory feedback of warning ‘growls’, and penalty tones
- Data downloaded automatically every day

Demonstrated Effectiveness

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

A key to safe ambulance transport
Extensive Indirect cost savings

- Fewer out of service vehicles
- Improved transport times
- Decreased administrative lost in managing unsafe behaviors
- Decreased legal burden
- Automatic system wide data
- Insurance benefits

Visibility and lighting issues

Policy and practice ignorant of existing technical safety data

![Graph showing luminous efficiency vs. wavelength](image)

Summit County EMS - Colorado

Old vehicle

New yellow vehicle markings
- Staff use lime-green vests & jackets

"The multicolored (patterned) ambulance while distinctive, may suffer decreased conspicuity because of the effects of camouflage" - De Lorenzo & Eilers Annals EM 1991

August 2009 - review
Risk/Hazards
- Predictable risks
- Predictable fatal injuries
- Serious occupational hazard
- Public safety hazards

What do we know works...
- Vehicle Operations Safety Policies
- Squad bench lap seat belts
- Patient over the shoulder harnesses
- Securing equipment
- Forward and rear facing seating
- Some electronic technical devices
- Safety awareness
- Cultural change

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

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
Conclusion

- Ambulance transport has serious hazards and safety issues
- Major advances in ambulance safety research, infrastructure and practice over the past 5 years
- New technologies for vehicle design, occupant and equipment restraint and driver performance are now available
- Failure to transfer knowledge from transportation and automotive safety is unacceptable and dangerous
- Ambulance is still way behind the state of the art in vehicle safety and occupant protection