Safety Strategies for EMS Fleets: What Works?

To quote Steve “Sid” Caesar –
Director IHS ES
“We want everyone to get home safely each day”

Key Issues
- Where is the state of the art
- What are the questions we need to ask
- Which are effective systems safety solutions

Future
- Goals
- New technologies
- Futuristic vehicles
- New policies
- New practices
- New Standards

Emergency Medical Services (EMS) Transport Safety
This afternoon’s scope

Key Issues
- The state of EMS transport safety research is an EMBARRASSMENT
- Lags at least 30 years behind general automotive and transportation safety research
- Global EMS vehicle safety research is sparse
- EMS Safety research is NOT EVEN ON THE PLAYING FIELD of state of the art automotive safety research
- “Reinventing the wheel” – should be avoided at all costs

EMS Safety Crisis
“The Chinese word for ‘crisis’ (危機) is made up of the words ‘danger’ (危) and ‘opportunity’ (機)”

Firstly, the DANGER...
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Firstly!
- An accident?
- or
- a predictable and preventable event

Then, the OPPORTUNITY
- This is vehicles, and this is transportation safety
- Vehicle and transportation safety technology and infrastructure exists
- Ditto drivers, and driver safety technology
- Collaboration, and the multidisciplinary model
- Optimal use of very scarce resource

Emergency Medical Services (EMS) An important and unique system
- Public safety, public health and emergency service
- Is there to save lives
- A more recent service compared to Fire and Police

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
Real world answers to real world questions -
- What policies offer the safest system?
- What features will enhance safety of ambulance vehicles?
- What technologies will optimize transport safety performance?
- What color scheme is best for vehicles and staff to make it safest?
- What data should be collected when something goes wrong, and how to best analyze it?

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?

A tragic emergency health care intervention outcome
- It does happen....

EMS Transportation Safety Key elements
- What is the appropriate data to collect?
- Which is the optimal method to capture it?
- How do you identify and implement appropriate solutions?

A serious fleet and safety problem...
- Ambulance transport
  - the most lethal vehicle on the road both per mile travelled and per vehicle
  - is exempt from federal safety oversight
  - has the worst transportation safety data capture for any ground transportation system AND....
  - Is THE VEHICLE THAT COMES TO RESCUE YOU ON THE HIGHWAY!!

Ground Ambulance Transport Safety IS Complex AND Multidisciplinary

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
Ambulance Transportation Safety

- Dispatch policy and procedures
- Vehicle Operations Safety
- Vehicle Crashworthiness
- Vehicle Ergonomics
- Clinical care policies
- Scene Safety

Occupational transportation fatalities...

WE HAVE A BIG PROBLEM HERE

2003 a problem...

2007 a bigger problem
2007 Insurance data –
- 27 fold more likely to have a claim based on transport than related to medical care

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

EMS CANNOT afford to keep paying out like this....

So an ambulance is...
- Most lethal vehicle on the road per mile traveled
- 3 times more lethal per vehicle than other vehicles on the road
- Not designed by automotive engineers - nor are design features based on known automotive safety technology or ergonomic science
- NO transportation systems oversight

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

Why is this crash different from every other crash
A devastating tragedy...

In contrast to medical error – such as an ETT down the wrong hole which may kill the 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......

Friday July 20th 2007...
The worst ambulance crash in USA history

Five Killed in Crash of Ambulance and Semi

July 21, 2007 06:20 AM EDT

The National Safety Council is a 150-year-old, 501(c)(3) nonprofit, nonpartisan organization that advances safety through leadership, research, education and advocacy.

January 25, 2008
EMS Transport Safety

'patient safety'

AND also

'provider' and 'public safety'

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

USA EMS

EMS Systems - >15,000

Personnel - ~1 million

(~50% 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

USA 1960’s

EMS is a relatively new industry

An unusual history of beginnings within the mortician industry.

Early ambulances were hearses, once motorized usually a Cadillac, a vehicle in which an occupant could be transported in the recumbent position

Over the past 100 years, the sophistication of EMS medical care has advanced dramatically

EMS communications and transportation technology have not kept up with that pace
1960 to 2007

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

Some recent adverse outcomes

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

What is a survivable impact?

\[ E = \frac{1}{2} m v^2 \]
\[ v^2 = 2as \]

\(~ 30 \text{ mph} ~- \text{ survivable}~\)

\(~ 60 \text{ mph} ~- \text{ not survivable}~\)

Thursday July 5th 2007...... Paramedic Allan Parson’s killed
"...I'd like to know what can be done so this never happens again...."

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

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

Why ISN'T EMS on the NTSB's Most Wanted List??

This IS a Transportation and Automotive Safety issue

This IS a Systems safety issue

... Nov 8th's Fatality

Jan 28th, 2008

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

- This IS a Transportation and Automotive Safety issue
- This is a Systems safety issue
April 14th, 2008

A paramedic and a patient killed in this vehicle...

April 20, 2008

A paramedic and a patient killed in this vehicle...

June 17th, 2008

A paramedic and a patient killed in this vehicle...

In this vehicle...

October 31, 2008 - Kentucky

February 11, 2009 – North Carolina

April 30, 2009 - Tennessee

Arlington, Texas – June 18, 2009
Minnesota - June 20, 2009

Fatalities and funerals

Charged with Vehicular Homicide

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

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

EMS Transportation Safety Standards.... An oxymoron?

October 2008 JEMS Article “Rig Safety – 911”

Goals

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

Valuable information... EMS exempt
FMCSA - Exceptions

> Unless otherwise specifically provided, the rules do not apply to—
> (f) All school bus operations as defined in §390.5;
> (f)(1) All transportation performed by the Federal government, a State, or any political subdivision of a State, or an agency established under a compact between States;
> (f)(2) Transportation performed by the Federal government, a State, or any political subdivision of a State, or an agency established under a compact between States;
> (f)(3) The occasional transportation of personal property by individuals not for compensation nor in the furtherance of a commercial enterprise;
> (f)(4) The transportation of human corpses or sick and injured persons;
> (f)(5) The operation of fire trucks and rescue vehicles while involved in emergency and related operations.

Canada - Corporate Manslaughter
Corporate Homicide Act: 8th April, 2008

EMS safety data estimates

In the USA*
> ~ 50,000 vehicles
> ~ 5,000 crashes a year
> ~ One fatality each week
> ~ 25 pedestrians or occupants of other car
> ~ 13 serious injuries per day
> ~ 10 serious injuries each day
> Cost estimates > $500 million annually
> USA crash fatality rate/capita 35x higher than in Australia

Commercial vehicle comparisons

> Estimates for ambulance fatality/mile traveled are 3 to 50 fold the rate of large truck fatal crashes:
  - Large trucks: 2.2 fatal crashes/100 million miles traveled in 2005
  - Ambulance: 2.7 to 109 fatal crashes/100 million ambulance miles traveled

> Injury estimates:
  - 37 truck crash injuries/100 million miles
  - Ambulance estimates of crash injury of 308 to 4,360 injuries/100 million ambulance miles traveled

> Ambulance vehicle occupant crash fatality percentage is double that for large trucks.

Is it your service’s tragic year?

> ~ 50 fatalities a year
> 15,000 EMS services
> Each year one in 300 EMS 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***
> Serious head injury in ~65% of fatal occupant injuries
> More likely to crash at an intersection with traffic lights (37% vs 16% p<0.001) & more people & injuries/crash than similar sized vehicles****

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Ambulance Safety Research:
A New Field

economics

epidemiology

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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.....
The real world

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

Dry

Stopped at

Perception + Reaction time Vehicle Braking time (dry)

Wet

Stopped at

Perception + Reaction time Vehicle Braking time (wet)

* Stopping distance: Perception time + Reaction time + Vehicle braking time (varies with age, skill, lighting, darkness, vehicle type, tire pressure, road etc)

What is actually happening during an ambulance crash

Test 1 – Right side impact

What is actually happening during an ambulance crash

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

NOT new technical data...

NOT new technical data...


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

Balance of concerns and risk during transport

The Driver

EMS Driver issues

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

Reference:


Side facing 4-point harnesses demonstrated to be lethal, even at slow ground vehicle speeds.
R & D “Ripoff and Duplicate”
- Avoid reinventing the wheel at all costs
- Where are the best practices that we need to transfer knowledge from

Safety concepts out there now
- Fleet Safety Management
  - Z-15
  - Driver monitoring and feedback
- Enhanced ambulance vehicle design
- Intelligent Transport Technologies - ITS
- Visibility and Conspicuity
- New Safety Standards

WEMSA – October 2007
1. Emergency Vehicle Operations Policy
2. Vehicle operations training and evaluation
3. A program of graduated driver responsibility
4. Drivers only age 25 and over
5. Complete stop at an intersection
6. Restricted use of Red Lights and Sirens
7. Monitoring of emergency vehicle operations

WEMSA covered some key and important policies and procedures
But…
- What about hours of service?
- What about visibility at the scene? For providers and the vehicles…?
- What about protective equipment?
- What about ambulance design safety?
- What about reporting of adverse events?

ASSE September 2007, Fleet Forum November 2008 and NIOSH/OSHA February 2009, It’s not magic….
American National Standard
ANSI/ASSE Z15.1-2006
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:
  \[ \text{Injury incident rate} = \frac{\text{Number of incidents with injury}}{\text{Vehicle mileage}} \times 1,000,000 \]

ISO 39001 – Being developed
- ISO 39001 - Principles of RTS management systems
  a) Focus on loss of life and health
  b) Holistic view
  c) Focus on results
  d) Leadership
  e) Process approach
  f) Continuous improvement
  g) Best available information
  h) Transparent and inclusive process
  i) Tailored implementation
  j) Systematic and structured
  k) Part of decision making

Road Safety at Work Library

UPS: The ‘Big Brown’
- No left turns – instead make three rights
- Don’t back up
- Don’t employ any drivers under 25 years of age
- Don’t employ anyone with a history of driving convictions

BHP - Key learnings for the organization were:
- Fatalities often have similar underlying causes
- High near miss reporting often correlates with declining injuries or fatalities
- Leadership visibility in the field is vital
- Hazard identification and risk awareness are fundamental to success.

Safety Improvement Roadmap
What about changing driver behavior in the real world??

Real-time invehicle telematics feedback and monitoring
- Not a “black box”
- Driver feedback operates instantly, in real time and automatically as thresholds are approached
- No manual component to identify hazardous performance
- Data downloads wirelessly
- IS effective form of driver monitoring – but also is a TRAINING device

Purpose of ‘Telematics Real – time 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

MEMS Snapshot
- Serve 500,000 people in Little Rock area
- Deploy 29 units daily
- 58,000 calls per year
- 2,400 square mile service area
- 195 full time / 75 part time uniformed employees
- 1.9 million miles annually
- Mean response time: 6 minutes

Graduated implementation for evaluation
- Phase I-
  - Blind data - no growls or tones, no ID capture
- Phase II
- Phase III-
  - Fully operational, identified data capture

Pilot 1
- Parameters monitored
  - Vehicle speed, cornering, seat belt use, back up spotters
  - Use of lights and sirens
  - Miles traveled
- Penalty counts for exceeding parameters are recorded, stored and downloaded daily for analysis and reports generated
- Response times and fiscal balances were reviewed pre and post implementation

Pilot 1
- A fleet of 36 ambulances, 250 drivers and 1.9 million miles of vehicle operations were monitored by the system for 18 months.
- Blind data collected from March 2003 for 3/12
- Identified data captured with the system fully operational from June 2003
- The parameters measured are –
  - Speed against user set limits – both hot & cold
  - Cornering velocity, g-forces, hard braking/acceleration
  - Use of seat belts, lights & sirens, turn signals
  - Parking brake, back up spotters

Pilot 1
- Parameters are monitored every second
  - Penalty counts for exceeding these parameters are recorded, stored on an on-board computer and downloaded daily to a base station for analysis and reports generated.
- Response times and fiscal balances were reviewed pre and post implementation of the monitoring and feedback system
Results Summary

- Sustained Effectiveness – seat belt
  - 12,000 seat belt violations dropped to 4
  - Fewer crashes and less severe crashes
  - No increase in response times
  - 20% cost saving in vehicle maintenance within 6 months
  - Implementation was well received by the providers

- Initial Demonstrated Effectiveness

- Implementation Environment Pilot 2
  - CAC deploys 13 units daily, covers 450,000 miles annually
  - CAC has 20 Emergency Vehicles and 11 Non-emergency Vehicles
  - Mean response time of 11 minutes
  - 152 drivers

- And when a rare crash happens….

- Sustained Effectiveness – speed

- Unit 302 Accident
Graduated implementation for evaluation

- **Phase I**
  - Blind data - no tones, no ID capture
  - 11/1/04 to 4/30/05
- **Phase II**
  - Warning and penalty tones only
  - 5/1/05 to 6/30/05
- **Phase III**
  - Fully operational, identified data capture
  - 7/1/06 to 8/31/06

**Auditory alarm warning thresholds**

<table>
<thead>
<tr>
<th>Speed</th>
<th>Pilot 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Speed (LSCOUNT)</td>
<td>10 second warning period</td>
</tr>
<tr>
<td>High Speed (HSCOUNT)</td>
<td>&gt;99 mph</td>
</tr>
<tr>
<td>Warning at 25%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cornering Low Over Force (LFCOUNT)</th>
<th>Cornering High Over Force (HFCOUNT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warning at 25% - 38% - 48%</td>
<td>Warning at 25% - 38% - 48%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reverse Count (RVCOUNT)</th>
<th>Seat Belt Distance (SBCOUNT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 count for each time vehicle is placed in reverse without engaging reverse spotting switch</td>
<td>1/10th mile with no belt secured</td>
</tr>
</tbody>
</table>

**Demonstrated Results**

- Over 950,000 miles of vehicle operations were recorded
- Major reduction in high over speed penalty counts
  - 14.94 penalties/mile in Phase I
  - 0.00003 penalties/mile in Phase III
- Major reduction in seatbelt violations
  - 4.72 violations/mile traveled in Period I
  - 0.001 violations/mile traveled in Period III a fold reduction in seat belt violations
- Similar trends were seen in low over speed and over force parameters

**Results**

<table>
<thead>
<tr>
<th></th>
<th>Phase I 11/01/04-04/30/05</th>
<th>Phase II 05/01/05-06/30/06</th>
<th>Phase III 07/01/06-08/31/06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance (miles)</td>
<td>193,210</td>
<td>682,320</td>
<td>75,957</td>
</tr>
<tr>
<td>LSCOUNT (LSCOUNT/mile)</td>
<td>89,250 [2.16]</td>
<td>100,195 [0.15]</td>
<td>96 [0.001]</td>
</tr>
<tr>
<td>HSCOUNT (HSCOUNT/mile)</td>
<td>12,936 [14.94]</td>
<td>14,448 [0.02]</td>
<td>2 [0.00003]</td>
</tr>
<tr>
<td>LFCOUNT (LFCOUNT/mile)</td>
<td>37,347 [0.19]</td>
<td>64,328 [0.09]</td>
<td>1,250 [0.02]</td>
</tr>
<tr>
<td>HFCOUNT (HFCOUNT/mile)</td>
<td>552 [0.003]</td>
<td>1,210 [0.002]</td>
<td>56 [0.001]</td>
</tr>
<tr>
<td>RVCOUNT (RVCOUNT/mile)</td>
<td>15,697 [12.31]</td>
<td>69,779 [0.10]</td>
<td>7,100 [0.09]</td>
</tr>
<tr>
<td>SBCOUNT (SBCOUNT/mile)</td>
<td>40,893 [4.72]</td>
<td>45,366 [0.07]</td>
<td>90 [0.001]</td>
</tr>
</tbody>
</table>

**Response times**

- There was no increase in average response times during the study period:
  - 11:14 minutes in 2004
  - 10:36 minutes in 2005
  - 10:46 minutes in 2006

suggests a moderate overall improvement in response times during the study period.

**Crashes**

- There were:
  - 19 vehicle incidents in 2004
  - 11 in 2005
  - no major vehicle crash during the fully implemented phase of the study period.

**Direct Cost savings**

- Decreased crashes
- Cost saving in vehicle maintenance expenses:
  - $271,091 in 2004
  - $242,965 in 2005
  - $237,193 in 2006

**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

**A key to safe ambulance transport**
Limitations

- No categorization of type/severity of crash
- Variable performance and exposure data per individual providers
- Unique environment may not be uniform across EMS services or generalizable
- No metric exists to provide a performance measure of the safety or risk exposure of an EMS system – which may differ depending on environment, transport hazards, call incidence and frequency, driver training and age.

Monitor and feedback device in summary

- The system works
- Has objectively improved performance
- No increase in response times
- At fault accidents reduced
- Now accepted into the culture

However:
- The system requires monitoring
- Must be reinforced by management
- Rewards for good safety performance
- Consequences for poor performance

Demonstrated clearly

- Driver risk behavior can be modified and improved with monitoring device, with real time auditory feedback.

Demonstrated Effectiveness

- Change driver behavior
- Carrot not stick
- Vehicle maintenance improvement
- Decreased administrative burden
- Insurance benefits

Intelligent Transport Safety Systems

Visibility and lighting issues

Policy and practice ignorant of existing technical safety data

Emergency Vehicles – Viewer Awareness

For a timely, appropriate and safe response
- Location
- Size
- Shape
- Speed
- Intended path

“Anything that lengthens reaction time increases the chance of an unwanted event”

Stephen Solomon
But whatever color .... If you run a red light someone will be killed.

Color-blindness affects 10% of the population.

As seen with normal vision

As seen with color blind vision

Help has arrived !! Worker visibility Act: November 24th 2008

Not rocket science..

This addresses some very real risks, very creatively – and currently ONLY available in London Ontario!

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
Innovation, collaboration & knowledge transfer
Vehicle Occupant Safety design

European design

Safety technology is a key focus

Safe and Ergonomic design

Ergonomic layout and equipment

Safety first - Passive Safety

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?

Were we safer in the Cadillac???

Fleet Mix?

No need to reinvent the wheel...

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

March 2007 - FHWA

Tips for Emergency Vehicle Operations

USFA Emergency Vehicle Safety Initiative
Traffic Incident Management Systems (TIMS)

- Released April 2008
- FEMA, USFA, IFSTA
- Covers setting up safe roadway incident work areas and using unified command at these incidents

Risk/Hazards

- Predictable risks
- Predictable fatal injuries
- Serious occupational hazard
- Public safety hazards

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 “Telematics”

What do we know works...

- Vehicle Operations Safety Policies
- Squad bench lap seat belts
- Patient over the shoulder belts
- Securing equipment
- Forward and rear facing seating
- Telematics feedback 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

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

Summary

- Transport systems engineering and human factors safety hazards are serious issues in EMS transport injury and fatality
- Ambulance transport is devoid of acceptable safety standards, and national oversight and minimally addressed by any meaningful data
- Transport safety technologies exist and have been demonstrated to have a substantial and sustained improvement in safety performance

Thank you! Any Questions??

- .pdf handout of this presentation awaits you online
  - www.objectivesafety.net