Strategies for Managing Ambulance Fleet Safety Issues

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Outline
- Review of the EMS fleet safety issues, risk management and economics
- Comprehensive review of the new Z-15 ANSI/ASSE fleet safety standard and other guidelines
- Update of the latest technology and other tools for optimizing fleet safety and a profile of safety technologies under development.
- Incentives and strategies involved in implementing safety developments to enhance fleet safety

Objectives
- Educate on the spectrum of hazard and risk related to fleet safety.
- Explain the elements of the new Z-15 ANSI/ASSE standard for fleet safety management
- Explore the implementation of new transport safety technologies and innovations
- Instruct on strategies and policies for enhancing fleet safety to minimize risk for patients, providers and the public

So...
- what policy changes could enhance transport safety?
- what do you see as obstacles to improving transport safety?
- what are ways to enhance awareness and understanding of transport safety issues?
- what devices could be considered to enhance transport safety?
- how is data on transport safety captured?
- how can you identify predictable and preventable risks during transport?

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
  - Mediation/litigation/lawsuit
  - Medical/medical costs of injured EMTs
  - Hiring of new employees to replace injured personnel
  - Relocating and psychological counseling of personnel involved and others
  - Increased insurance rates

New paradigm - Integration of EMS
- Public health departments
- Social service agencies
- Community outreach
- Hospitals
- Health care networks / Insurers
- Industry

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New paradigm - Integration of EMS
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- Industry
EMS Transport Safety

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

Key Elements to Safety

- Data Capture
  - Vehicles
    - Total number and type
    - Total number of runs
    - Total number of miles traveled
  - Providers
    - Total number and type
    - Hours worked
  - Transportation adverse events, including mechanism – both injuries and fatalities
    - The vehicle
    - Patient
    - Provider
    - Public

- Vehicle Biomechanics and Crashworthiness
  - Vehicle
    - Compact crashworthy vehicles (i.e., vans)
    - Non-hostile interiors
    - Lock down positions for equipment
    - Seat belts for all occupants
    - Over-shoulder harnesses for all patients on the stretcher

- Ergonomics and Biohazards
  - PPE
    - Head protection
    - Protective Clothing
    - Visibility
    - Biohazard protection
  - Equipment and Vehicle Layout and Design
    - Equipment interface ergonomics
    - Vehicle interface ergonomics and human factors
    - Vehicle visibility and appropriate warning signals

- Transportation Environment
  - Integration with Highway Safety strategies
    - Partnerships/collaboration and Information sharing
  - Intelligent Transportation System (ITS) Technologies
    - Driver/vehicle performance monitoring & feedback devices
    - Collision avoidance vehicle technologies
    - Signal systems
  - Roadside safety design and planning technologies
    - Vehicle positioning and scene safety issues
    - Hospital ambulance bay access and egress
  - Fleet mix
    - Rapid response vehicles
    - Vans, Trucks, Motorcycles, other

Best Practice.....? The technology described in your junk mail is far more advanced than that used in EMS

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 traveling at ~40mph in the hope that this would result in a safety intervention, is at best frightening.

Guidelines – standards

- Transport safety
- Practice protocols
- Occupational Health and Safety

Risk Awareness before & after a 1 hour presentation

<table>
<thead>
<tr>
<th>Pre %</th>
<th>Post %</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception of the hour compromised to a high risk of serious injury</td>
<td>43</td>
<td>76</td>
</tr>
<tr>
<td>Likelihood of it occurring for this concern for safety in the rear of the ambulance</td>
<td>16</td>
<td>72</td>
</tr>
<tr>
<td>Likelihood of always wearing a seat belt</td>
<td>14</td>
<td>19</td>
</tr>
<tr>
<td>Considering wearing a limited motion safety harness</td>
<td>51</td>
<td>57</td>
</tr>
<tr>
<td>Self-report of always wearing a seat belt</td>
<td>31</td>
<td>81</td>
</tr>
</tbody>
</table>

Pennsylvania Code

911 Call to Hospital/ED Definitive Care Time Intervals*

<table>
<thead>
<tr>
<th>Time Interval</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency Occurs</td>
<td>911 contacted</td>
<td>EMS vehicle dispatched</td>
</tr>
<tr>
<td>EMS arrives on scene</td>
<td>EMS leaves scene</td>
<td>EMS arrives at ED EMS bay</td>
</tr>
<tr>
<td>Hospital/ED definitive care</td>
<td>EMS scene</td>
<td>EMS scene to hospital transport time (X)</td>
</tr>
<tr>
<td>ED EMS bay to hospital/ED definitive care time (Y)</td>
<td>EMS dispatch time</td>
<td>EMS response to the scene time</td>
</tr>
</tbody>
</table>

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
4. 1 + 2 + 3 = resultant inability to design and evaluate efficacy of injury interventions
5. What oversight is there?
6. Which organizations would determine policy?

Haddon/Baker/Runyan Phase-Factor Matrix as applied to EMS Safety*

<table>
<thead>
<tr>
<th>Phase</th>
<th>Factor</th>
<th>Effectiveness</th>
<th>Cost benefit</th>
<th>Ethics</th>
<th>Social acceptability</th>
<th>Societal need</th>
</tr>
</thead>
</table>

Some challenges

- No accepted national safety standards for -
  - EMS fleet management or safety practice
  - Ambulance vehicle rear compartment design and performance
  - Provider occupational injury protective equipment
- Yet convincing data for injury risk and hazard
- Need for patient, provider and public safety focus

Safety data on EMS transport and its oversight

- EMS vehicle crash rates are in excess of similar sized vehicles
- EMS worker transport fatality rates are well above other emergency services
- Is exempt from Federal Motor Vehicle Safety Standards (FMVSS), and not covered by other national transportation system safety oversight (ie. FMCSA)
- Almost non existent ergonomic research or data
- The findings of limited research conducted to date suggest EMS transportation safety is in need of urgent focus and has been left behind commercial truck and bus safety.

A number of potential interventions to enhance safety have been identified:

- Safety Policy
- Safety performance standards
- Vehicle crashworthiness
- Vehicle interior ergonomics
- Personal Protective Equipment design
- Driver selection, training and simulation
- Safety and risk awareness modification
- Risk behavior modification
- Intelligent Transportation Systems (ITS)
This is happening out there NOW....

Gregg Theunes Appeal to his Senator, December 29, 2005

2007....

- "Pizza delivery truck" approach has got to go
- As do the religious "beliefs" about occupant protection
- Z15.1 – we must at least know what we are doing and have consistent and meaningful safety programs and practices

Safety oversight of what and by whom

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

The National Transportation Safety Board (NTSB)

NTSB 1979 Accident Report

Recommendations
- EVOC
- LICENSE RECORDS

NTSB: 1979 Recommendations never implemented

- To NHTSA – Class II & III Priority Action
  - Extend Federal Motor Vehicle Safety Standards (220, 221, 301) to include ambulances and other emergency vehicles
  - Extending FMVSS re: padding and restraints
- To GSA – Class II Priority Action
  - Maintenance of handling
  - Loading instructions
  - Body anybody integrity
  - Anchorage for all equipment
  - Occupant protection
- To National Committee on Uniform Traffic Laws
  - Modify criteria
What about FMCSA’s Mission

> Office of Research and Analysis is committed to reducing the large truck-related fatality rate from 2.8 per 100 million truck-miles in 1996 to 1.65 by 2008.

Mission

> The mission of FMCSA’s Office of Research and Analysis is to reduce the number and severity of commercial motor vehicle (CMV) crashes and enhance the efficiency of CMV operations by:

  1. Conducting systematic studies directed toward fuller scientific discovery, knowledge, or understanding
  2. Adopting, testing, and deploying innovative driver, carrier, vehicle, and roadside best practices and technologies
  3. By expanding the knowledge and portfolio of deployable technology, the research and technology program will help FMCSA reduce crashes, injuries, and fatalities and will deliver a program that contributes to a safe and secure commercial transportation system.

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

Issues

> Patient, provider and public safety
  > Key issues
    1. Essential Emergency service
    2. Low budget
    3. All environments
    4. Recruitment and retention issues
    5. Technology dark ages
    6. Communication, administrative, transportation
      and health care data challenges

EMS is multidisciplinary

> Did someone design this system as a stationary one - that didn’t move??
  > This IS acute health care communications AND transport

Air EMS is a role model for safety initiatives and focus

> Primary focus has been physician driven - optimizing acute health care and practice
  > But.... NOT optimizing
    1. Communications/data – administrative and health care
    2. Transportation aspects and safety

Air and Ground EMS

> Major differences in safety culture and approach
  > Dichotomy of Safety standards
  > Diverse safety oversight
  > Absent ground safety regulatory control

An Aviation Safety Plan

Air Safety Approach

> Safety Program Planning
  > Evaluating
  > Analysis of Safety Performance
  > Analysis of Safety Information and Data
  > Analysis of Risk Profiles and Plans
Ground Transport Safety

Unique workplace
- In vehicles
- At roadside and other emergency scenes

Safety process
- Identify hazards
- Raise awareness of safety issues
- Create a safety attitude
- Promote Teamwork
- Provide motivation
- Accomplish established goals

Safety Management
- Culture of Safety
- EMS Practice and Policy
  - Fleet dispatch
  - Safe driving policy and practice
  - Determination and tracking
  - Seat belt use policy - for providers, patients and passengers
  - Safety monitoring and feedback
  - Stop at red lights and stop signs
  - Emergency Vehicle Operators Course (EVO): Fleet
  - Secure all equipment
  - Use portable communications
  - Notify driver if rear occupants are in vulnerable positions
- Fleet Management
  - Fleet Safety program
  - ANSI/ASSE Z15

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

Creating a Safety Culture
- within a company must start with upper management’s commitment to safety
- Awareness
- Training
- Incentive

Safety leadership… from the IAFC and USFA

Integration and Collaboration

- EMERGENCY MEDICAL SERVICES DISPATCH SERVICES
- EMERGENCY MEDICAL SERVICES PARTNERSHIPS
  - Increase the participation and role of Regional EMS Councils in local and regional highway traffic safety boards and/or organizations
- PRE-HOSPITAL TRAINING PROGRAMS
  - Include the provider in studies of EMS course development in New York State providers in the use of these protocols, and collaboration with Regional EMS Councils, other agencies, and local and state departments of motor vehicles
- ROAD CONDITION AND INCIDENT RESPONSE
  - Provide a representative for regional and/or county EMS representatives in statewide/county management and implementation

Safety leadership… from the IAFC and USFA

EMS RESPONDER CRASH PREVENTION
- Undertake a systematic review of other state actions and protocols to identify those that may contribute to injuries resulting from the impact of ambulance crashes.
- Increase education and involvement of EMS providers in principles of appropriate traffic safety techniques.
- Develop and implement ambulance traffic safety protocols at state, regional, and service level.
- Identify and develop 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 driver awareness of driver responsibility and appropriate response to approaching emergency vehicles.

Risk Exposure Rates

<table>
<thead>
<tr>
<th>Type of Vehicle</th>
<th>Crashes per 100 million miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobile</td>
<td>405</td>
</tr>
<tr>
<td>Light Truck</td>
<td>386</td>
</tr>
<tr>
<td>Large Truck</td>
<td>212</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>849</td>
</tr>
<tr>
<td>Urban Ambulance</td>
<td>3,200</td>
</tr>
</tbody>
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EMS Injuries*

- Higher than the injury rate for any private industry published by DOL.
- 34.6 injuries/100 fulltime workers per year.
- 1.5 x that of fire fighters.
- 5.8 x that of health services personnel.
- 7 x the national average.

And the injury events...

<table>
<thead>
<tr>
<th>Injury Type</th>
<th>Percentage of cases %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifting</td>
<td>6.0</td>
</tr>
<tr>
<td>Transportation</td>
<td>4.0</td>
</tr>
<tr>
<td>Overexertion</td>
<td>3.0</td>
</tr>
<tr>
<td>Falls</td>
<td>2.5</td>
</tr>
<tr>
<td>Assault</td>
<td>0.5</td>
</tr>
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Cultivating a Culture of Safety

- At a Service level:
  - Communicate
  - Collaborate
  - Educate
  - Regulate
- Standards for safety
- Practice policy based on Science
- Databases to demonstrate outcome

Transport Safety Goals

- Standards for safety
- Practice policy based on Science
- Databases to demonstrate outcome

Absence of standards and oversight

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

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.
The “Black Box”
Driver behavior monitoring and feedback device

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

Program benefits:
- 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

Monitoring and feedback devices
- Implementation well received by the providers.
- 20% cost saving in vehicle maintenance within 6 months.
- No increase in response times
- Fewer crashes and less severe crashes
- Sustained improvement in safety proxies, with no inservice or retraining after the initial introduction period.

Demonstrated Effectiveness


Total Miles Driven Monthly 2003-2004 and Average Between Count Miles 2003-2005

A key to safe ambulance transport
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

The jury is out on

- Opticon
- Simulators

Data, but is it generalizable

EMS is emerging in the transport safety arena
- First and only presentation of ambulance safety research at ESV Congress was 2001
- SAE Toptec on Military and Emergency Vehicles, USA, September 2001
- Emergency Vehicle Symposium, Australia, Melbourne, May 2003
- Sporadic Ambulance safety research presented at peer reviewed AAAM, ITMA, SAEM, Safe America, World Injury, Asia Pacific Injury Conferences 1999-2005
- Next week at inaugural meeting at 2007 TRB Congress in DC

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

Safety for emergency transport

Policy that reflects SCIENCE

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

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…
Awkward to use

Gets caught and scratched

Key Helmet Features

New EMS helmet prototypes for 2006-2007

Securing equipment

The inevitable bottom line...

Safety saves time, lives AND money
Canada, Nova Scotia

• Since 2000 working towards a goal of zero loss ratio with insurance provider
• 10 million kilometers per year
• 150 emergency response ambulance units
• Collision claim history measured in dollars per 100,000 kilometers traveled:
  - 2000/2001 $1725.00
  - 2001/2002 $1049.00
  - 2002/2003 $ 751.00
  - 2003/2004 $ 416.00
  - 2004/2005 $ 229.00

Very Scary insurance data

<table>
<thead>
<tr>
<th>Year</th>
<th>Payroll $1,000</th>
<th>Modified</th>
<th>Modified</th>
<th>Modified</th>
<th>payroll</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>14.1</td>
<td>940</td>
<td>985</td>
<td>9325</td>
<td>25</td>
</tr>
<tr>
<td>2002</td>
<td>12.8</td>
<td>917</td>
<td>909</td>
<td>925</td>
<td>25</td>
</tr>
<tr>
<td>2001</td>
<td>11.3</td>
<td>634</td>
<td>63</td>
<td>128</td>
<td>50</td>
</tr>
<tr>
<td>2000</td>
<td>10.6</td>
<td>620</td>
<td>62</td>
<td>188</td>
<td>49</td>
</tr>
<tr>
<td>1999</td>
<td>10.1</td>
<td>625</td>
<td>61</td>
<td>117</td>
<td>56</td>
</tr>
<tr>
<td>1998</td>
<td>9.8</td>
<td>611</td>
<td>61</td>
<td>60</td>
<td>50</td>
</tr>
</tbody>
</table>

Workers Compensation Rate increased by 26.5% from 2005-2006
Now it is $7.41 for 2006-2007
EMS CANNOT Afford to keep paying out like this…

Transport related aspects of EMS
- dispatch of EMS vehicles
- transport policies and protocols
- vehicle fleets and vehicle design
- vehicle and fleet standards
- Intelligent Transportation Systems technology
- driver selection/training
- shift length and wellness
- driver performance monitoring and feedback
- roadside and road design
- integrated traffic safety technologies
- scene safety and visibility
- safety data capture
- safety oversight

Policy Changes

CPR?

EMSNetwork

New York too...

Important changes underway

Key issues are being addressed

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
Scope of the Z15.1 Standard

- For the safe operation of motor vehicles owned or operated by organizations, including:
  - Definitions
  - Management Leadership Administration
  - Operational Environment
  - Driver Considerations
  - Vehicle Considerations
  - Incident Reporting and Analysis

- These practices are designed for use by those having the responsibility for the administration and operation of motor vehicles as a part of organizational operations.

Safety Program

- 3.2 Organizations shall have a written vehicle safety program that defines organizational requirements for driver and vehicle safety.

- Safety Program shall include the following elements:
  - Safety policy
  - Responsibilities and accountabilities
  - Driver recruitment, selection, and assessment
  - Organizational safety rules
  - Orientation and training
  - Reporting rates and major incidents to executive
  - Communications
  - Vehicle specifications
  - Inspections and maintenance
  - Driver and recognition
  - Regulatory compliance management
  - Management program audits

Safety Policy

- Organizations shall establish a formal safety policy that states management’s concern for the health and well-being of drivers throughout the organization.

- The policy shall establish the expectation that drivers comply with all aspects of the organization’s vehicle safety program, as well as obey applicable local, state and federal laws and regulations as they relate to vehicle operations.

Responsibilities and Accountabilities

- A system of responsibility and accountability shall be established throughout the organization in order to ensure effective implementation of the vehicle safety program.

Driver Recruitment, Selection, and Assessment

- 3.2.1.3 The organization shall implement a system that recruits and selects drivers to ensure safe operation and management of the motor vehicle safety program.

Organizational Safety Rules

- 3.2.1.4 Organizations shall develop and implement organizational safety rules that address the specific issues for the organization.

- All drivers found to be in violation of these safety rules shall be counseled or disciplined in a fair and uniform manner consistent with the organization’s policies.

Orientation and Training

- 3.2.1.5 A process of orientation and training shall be established in order to ensure safe and effective operation of vehicles.

Reporting Rates and Major Incidents to Executives

- 3.2.1.6 The organization shall implement a system that requires the investigation and analysis of incidents in order to report major incidents, trends, and safety performance to all management levels of the organization.

- A system of immediately reporting all major incidents to top management shall be implemented.

Oversight

- 3.2.1.10 Regulatory Compliance Management. Organizations shall have a system in place to monitor federal, state, and local regulations in order to comply with all regulations and implement any policy / procedure change in a timely manner.

- 3.2.1.11 Management Program Audits. Organizations shall have an auditing process that monitors compliance with regulations and the organization’s motor vehicle safety program.
Some new challenges

Crash reporting to whom?
Crashworthiness to what standard?
Ergonomics based on what ergonomic requirements?
Driver selection/training and monitoring - based on what guidelines?

Legal Perspectives on Z.15

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??

Challenges of absent formal safety standards

Choose the Best Option

New Australian vehicles
Flexibility to manage two patients
UK Ambulance vehicles
Clear safety message

Sweden initiatives

Norway initiatives

Other successful models

Fleet Mix?

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?
What is the best safety plan?
What is optimal safety equipment?
What are the best safety policies?

For our current fleet

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

Future

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

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
**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.

**Some simple and available solutions out there now**
- Intersection Policy
- PPE
- Black boxes

**Conclusion**
- Ground EMS is way behind air in safety approach
- Absent national safety oversight
- Lacking safety standards
- Inadequate systems safety design
- Poor vehicle safety design
- Prevention is key - the transport environment includes predictable and preventable risks.
- Many good models for safety planning
- Do not ‘reinvent the wheel’ – learn from air, fire, fleet, truck and bus and leading EMS models.