Medical Transport Leadership Institute,
Oglebay,
April 29th, 2008

Operationalizing Your Ground Safety Plan

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Outline

- How do you develop a ground transport safety plan
- How do you know your plan is working
- Highlight how the air and ground safety plans are different
- How to begin developing and operationalizing a comprehensive ground transport safety plan.
- How to ensure your plan is appropriate and being used by crews
- How to help develop ways to monitor the plans use and effectiveness.

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

Creating a Safety Culture

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

- Awareness
- Training
- Incentive

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

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 "Feedback Boxes"
- Monitor crash events with common denominators (ie. per 100,000 miles and per trip)

http://www.objectivesafety.net

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?

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

Challenges to Optimizing EMS Transport Safety

- Disparate and fragmented safety infrastructure
- Lack of a centralized EMS Safety oversight or data
- A large number of small groups of end users, with a mix of volunteers and professionals
- Ambulances are hybrid non-standard vehicles, a truck chassis and an after market box or a modified van
- EMS vehicle safety is not integrated as a part of the transport safety industry

Key Elements to Safety

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

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

EMS Transport Safety

- 'patient safety'

  AND also
- 'provider' and 'public safety'

New paradigm - Integration of EMS

- Public health departments
- Social service agencies
- Community outreach
- Hospitals
- Health care networks / Insurers
- Industry

What's new

- New automotive safety technologies
  - EVS
  - ITS
  - Monitoring and feedback enhancements
- New expertise
  - TRB
  - ASSE
  - SAE
  - UTRC
  - Ergonomics
  - Industrial Design

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

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?

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 estimates are - 7.66 - 41.93 fatalities per 100 million ambulance-miles

Issues

- Patient, provider and public safety
- Key issues
  - Essential Emergency service
  - Low budget
  - All environments
  - Recruitment and retention issues
  - Technology dark ages
  - Communication, administrative, transportation and health care data challenges

EMS is multidisciplinary

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

Cultivating a Culture of Safety

- At a Service level
  - Communicate
  - Collaborate
  - Educate
  - Regulate

Transport Safety Goals

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

Absence of standards and oversight

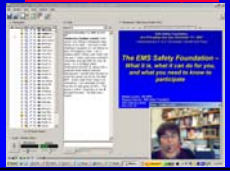
- Challenges in identifying best practice
- Myriad of unregulated commercial products
- No safety performance standards
- Absent national safety oversight

New Information 2006-2008

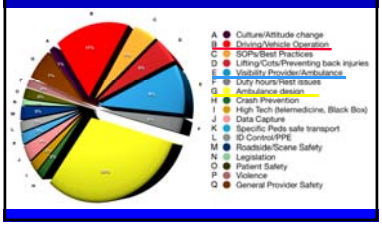
- Enhanced Safety of Vehicles (ESV), June 2007
- American Society Safety Engineers (ASSE), June 2006 & June 2007
- International Ergonomists Association (IEA), June 2006
- Transportation Research Board – EMS Safety address, Jan 2007
- AMD Engineering Public Comments, July 2007
- KKK-F, August 2007
- OSHA September 11, 2007 Federal Register
- SAFETEA-LU, 2006
  - (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users)
- State Strategic Highway Safety Plans, October 2007
- State EMS Council Policies
- APHA, Nov 2007
- Transportation Research Board – Inaugural EMS Safety Subcommittee meeting Jan 2008
- NIOSH Emergency Responder Round table March 2008
- OSHA EMS best practices late 2008
- Worker visibility Act, to be implemented, Nov 2008

The EMS Safety Foundation

Intro and Logistics Webinars from December 11th 2007 & Jan 8th 2008
EMS Safety Foundation tab at
www.objectivesafety.net



Key 5 Safety Priority areas of focus Here is what you sent in: n = 155



Relative Priority Issues

- Priority Number one
  - Vehicle ops - 29%
  - Ambulance design - 27%
- Priority Number two
  - Ambulance design - 35%
  - Vehicle ops - 29%

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)


About the NTSB

History and Mission

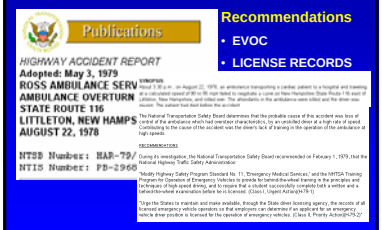
The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in the other modes of transportation -- railroad, highway, marine and pipeline -- and issuing safety recommendations aimed at preventing future accidents. The Safety Board determines the probable cause of:

- all U.S. civil aviation accidents and certain public-use aircraft accidents;
- selected highway accidents;
- railroad accidents involving passenger trains or any train accident that results in at least one fatality or major property damage;
- major marine accidents and any marine accident involving a public and a nonpublic vessel;
- pipeline accidents involving a fatality or substantial property damage;
- [illegible]
- selected transportation accidents that involve problems of a recurring nature

The Board derives its authority from Title 49 of the United States Code, Chapter 11. The rules of the Board are located in Chapter VIII, Title 49 of the Code of Federal Regulations.

The NTSB is responsible for maintaining the government's database of civil aviation accidents and also conducts special studies of transportation safety issues of national significance. The NTSB provides investigators to serve as U.S. Accredited Representatives in

NTSB 1979 Accident Report


Publications

HIGHWAY ACCIDENT REPORT

Adopted: May 3, 1979

ROSS AMBULANCE SERV
AMBULANCE OVERTURN
STATE ROUTE 116
LITTLETON, NEW HAMPS
AUGUST 22, 1978

NTSB Number: HAR-79/
NTIS Number: PB-2968

SYNOPSIS

About 3:30 p.m., on August 22, 1978, an ambulance transporting a cardiac patient to a hospital and traveling at a calculated speed of 80 to 90 mph failed to negotiate a curve on New Hampshire State Route 116 east of Littleton, New Hampshire, and rolled over. The attendants in the ambulance were killed and the driver was injured. The patient had died before the accident.

The National Transportation Safety Board determines that the probable cause of this accident was loss of control of the ambulance which had uncertain characteristics, by an unskilled driver at a high rate of speed, contributing to the cause of the accident was the driver's lack of training in the operation of the ambulance at high speeds.

RECOMMENDATIONS

During its investigation, the National Transportation Safety Board recommended on February 1, 1979, that the National Highway Traffic Safety Administration:

"Modify Highway Safety Program Standard No. 11, 'Emergency Medical Services,' and the NHTSA Training Program for Operation of Emergency Vehicles to provide for behind-the-wheel training in the principles and techniques of high-speed driving, and to require that a student successfully complete both a written and a behind-the-wheel examination before he is licensed. (Class I, Urgent Action)(H-79-1)

"Urge the States to maintain and make available, through the State driver licensing agency, the records of all licensed emergency vehicle operators so that employers can determine if an applicant for an emergency vehicle driver position is licensed for the operation of emergency vehicles. (Class II, Priority Action)(H-79-2)"

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 structural integrity
  - Anchorage for all equipment
  - Occupant protection
- To National Committee on Uniform Traffic Laws
  - Modify criteria

?

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


Corporate Manslaughter and Corporate Homicide Act 2007

Integration and Collaboration

EMS Transport Safety Strategies - 2006-2007 New York State Strategic Highway Safety Plan

State Strategic Highway Safety Plans

- Required as part of the SAFETEA-LU legislation
  - (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users)
- Effective October 1st 2007
- Focus is the 4 'E's
  - Engineering
  - Education
  - Enforcement
  - Emergency Medical Services
- EMS is a core theme

State SHSP EMS Focus*

STATE SHSP	AREA of EMS FOCUS
New York EMS Section 6 of 43 pages	1. Emergency Medical Services Dispatch Services 2. Emergency Medical Services Partnerships 3. Pre-hospital Training Programs 4. Road Condition and Incident Response 5. EMS Responder Crash Prevention
Montana EMS Section 4 of 36 pages	1. Establish EMS Legislation and Regulation 2. Provide EMS Funding 3. Enhance Capabilities for Medical Response to Disaster 4. Expand EMS Human Resources 5. Enhance EMS Education System 6. Expand EMS Services 7. Facilitate EMS Communications 8. Conduct EMS Public Education and Information Programs 9. Conduct Injury Prevention Public Awareness Efforts 10. Enhance Medical Direction 11. Provide Enhanced Trauma System and Facilities 12. Establish an EMS Information System 13. Evaluate and Monitor EMS Programs
Alabama EMS Section 8 of 47 pages	1. Identify and Analyze Performance Data 2. First Responders 3. Identify Crash Location 4. Statewide assessment and Plan 5. Improve EMS Rural Access

*Cordi H, Levick N, Strategic Highway Safety Plans –Where is EMS?, Jan 2008

EMS Transport Safety Strategies - 2006-2007 New York State Strategic Highway Safety Plan

- 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
  - Train EMS providers in the use of the new medical protocols; provide funds and/or other support to certified EMS Course Sponsors to train EMS providers in the use of these protocols; and collaborate with Regional EMS Councils and/or Regional Emergency Medical Advisory Committees (REMAC) on the development and implementation of training programs
- ROAD CONDITION AND INCIDENT RESPONSE
  - Provide a placeholder for regional and/or county EMS representatives in municipal DOT emergency management plan development and implementation

EMS Transport Safety Strategies - 2006-2007 New York State Strategic Highway Safety Plan

- EMS RESPONDER CRASH PREVENTION
  - Undertake a systematic review of other state 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 involvement of EMS providers in principles of appropriate traffic safety techniques
  - Develop and implement ambulance traffic safety protocols at state, regional and service level
  - Review treatment modalities 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 driver awareness of driver responsibility and appropriate response to approaching emergency vehicles

Policy makes a difference…

Organizational policy and other factors associated with emergency medical technician seat belt use

"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*

Vehicle Operations Position Statement

Emergency Vehicle Operations

Position Statement

October 2007

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?

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
  - Tiered dispatch
  - Safe driving policy and practice
  - Driver selection and training
  - Seat belt use policy - for providers, patients and passengers
  - Safety monitoring and feedback
  - Stop at red lights and stop signs
  - Emergency Vehicle Operators Course (EVOC)
  - Secure all equipment
  - Use portable communications
  - Notify driver if rear occupants are in vulnerable positions
- Fleet Management
  - Fleet Safety program
  - ANSI/ASSE Z.15

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

Key Elements to Safety

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

Vehicle Biomechanics & 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

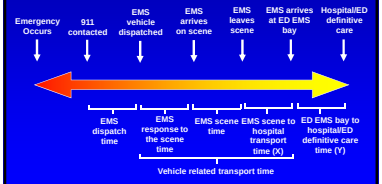
Ergonomics and Biohazards

- 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

911 Call to Hospital/ED Definitive Care Time Intervals*

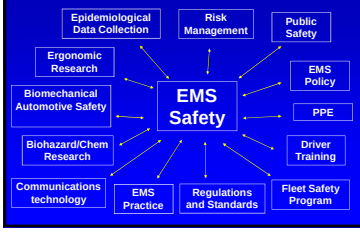


*Not drawn to scale

This is about you and your safety

- What safety practices do you use??
  - Seat belts ?
  - EVOC training ?
  - Equipment lock down ?
  - Helmets ?
  - "Black Box" technology ?
  - Tiered dispatch ?

EMS Transport Safety IS Complex AND Multidisciplinary



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

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

Safety process

- Identify hazards
- Raise awareness of safety issues
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- Accomplish established goals

Safety Management

- Culture of Safety
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  - Stop at red lights and stop signs
  - Emergency Vehicle Operators Course (EVOC)
  - Secure all equipment
  - Use portable communications
  - Notify driver if rear occupants are in vulnerable positions
- Fleet Management
  - Fleet Safety program
  - ANSI/ASSE Z.15

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

Expensive….

The Huntsville Times

Ambulance suit gets $3.1 million

Meridianville teen killed in wreck with speeding vehicle

Tuesday, May 01, 2007

By DAVID HOLDEN
Times Staff Writer davidholden@bhmnews.com

A federal jury awarded $3.1 million in damages Friday to the family of a Madison County woman who was killed in a collision with a speeding ambulance from Tennessee in 2005.

A felony charge of manslaughter is still pending in Madison County Circuit Court against the ambulance driver, Charles Christopher Eakes of Tennessee.

Dianna Christine Bowdan, 18, of Meridianville died in a two-vehicle crash Oct. 13 involving the ambulance owned by Lincoln County Medical Center Emergency Services. The wreck occurred around 9:45 p.m. at U.S. 231/431 and West Limestone Road, about seven miles north of Huntsville.

The inevitable bottom line…

Accident Cost Table

REVENUE NECESSARY TO PAY FOR ACCIDENT LOSSES

THIS TABLE SHOWS THE DOLLARS OF REVENUE REQUIRED TO PAY FOR DIFFERENT AMOUNTS OF COSTS FOR ACCIDENTS

It is necessary for a motor carrier to generate an additional $1,250,000 revenue to pay the cost of a $25,000 accident, assuming an average profit of 2%. The amount of revenue required to pay for losses will vary with the profit margin.

YEARLY ACCIDENT COSTS	PROFIT MARGIN				
	1%	2%	3%	4%	5%
$1,000	100,000	50,000	33,000	25,000	20,000
5,000	500,000	250,000	167,000	125,000	100,000
10,000	1,000,000	500,000	333,000	250,000	200,000
25,000	2,500,000	1,250,000	833,000	625,000	500,000
50,000	5,000,000	2,500,000	1,667,000	1,250,000	1,000,000
100,000	10,000,000	5,000,000	3,333,000	2,500,000	2,000,000
150,000	15,000,000	7,500,000	5,000,000	3,750,000	3,000,000
200,000	20,000,000	10,000,000	6,666,000	5,000,000	4,000,000

REVENUE REQUIRED TO COVER LOSSES

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

Year	Payroll $million	Modified Premium $1,000	Incurred Indemnity $1,000	Incurred Medical $1,000	Total Claims #
2003	14.1	540	885	9,925	93
2002	12.6	547	266	255	78
2001	11.3	454	88	128	55
2000	10.6	420	63	194	89
1999	10.1	405	115	117	56
1998	9.6	411	13	30	51

Workers Compensation Rate increased by 26.5 %
Was $5.86/$100 payroll in 2005-2006
Now it is $7.41 for 2006-2007

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)


DENVERPOST.com

Colorado to require air-ambulance licenses

Beginning next month, air ambulances in Colorado will - for the first time - have to be licensed and meet a comprehensive set of quality and safety standards.

The licensing requirement was five years in the making, and when it takes effect Feb. 1, only five states will remain that do not license air-ambulance operators, ...

As an insurer, "it comforts me to know there are those standards in place," she said. "It's not a perfect magic bullet, but it makes you take a hard look at how you run your business."

Colorado is at the forefront of states requiring providers to not only license companies but also

Safety concepts out there now

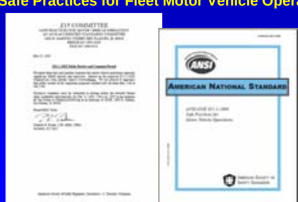
- Fleet Safety Management
  - Z-15
  - Driver monitoring and feedback
- Enhanced ambulance vehicle design
- Intelligent Transport Technologies - ITS
- Visibility and Conspicuity
- New Safety Standards
- Life Safety Initiatives
- Resources and information

Systems Safety Engineering - Z.15…..

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

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 Ad-ministration
  - 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 account-abilities
  - Driver recruitment, selection, and assessment
  - Organizational safety rules
  - Orientation and training
  - Reporting rates and major incidents to executives
  - Communications
  - Vehicle specifications
  - Inspections and maintenance
  - Reward 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.

Operational Environment

- 4.1 Occupant Restraints.
  - Organizations shall establish a policy addressing the use of occupant restraints, including the use of safety belts (seat belts/shoulder harness).
- 4.2 Impaired Driving.
  - Organizations shall establish a policy regarding the use of drugs and alcohol as well as any other conditions that may adversely affect the ability to safely operate a motor vehicle.
- 4.3 Distracted Driving.
  - Organizations shall have a policy regarding potential distractions while driving.
- 4.4 Aggressive Driving.
  - Organizations shall have a policy regarding aggressive driving.

Z15 Vehicle and Driver aspects

- Operational Environment
  - 4.1 Occupant Restraints.
  - 4.2 Impaired Driving.
  - 4.3 Distracted Driving.
  - 4.4 Aggressive Driving.
- Driver Qualifications
- Vehicle
- Vehicle Acquisition
  - E6.1 Safety Considerations
- Vehicle Inspection & Maintenance
- Incident Reporting & Analysis

Driver Qualifications

- 5.1. Background Checks.
  - Organizations shall perform applicant background checks, in accordance with applicable privacy laws. Organizations shall have a written policy as to what would disqualify an applicant.
- 5.2 Driver Management.
  - A driver management program shall be established to help assure that the driver is following organizational procedures.
- 5.3 Driver Training Program.
  - Organizations shall establish a driver training program. The training program shall address requirements for new drivers, continuing education of existing drivers, and instances where remedial training shall be required.
- 5.4 Record Keeping.
  - Organizations shall maintain documentation of the qualifications and driving records of drivers. And to verify that a driver has received training.

Vehicle

- 3.2.1.8 Vehicle Specifications. A system shall be established to ensure the proper vehicle is selected for the intended safe use.
- 3.2.1.9 Inspections and Maintenance. Organizations shall establish a system of vehicle/equipment inspections and maintenance for safe operations.
- 6.1 Vehicles shall be specified and purchased based on the activities to be performed.

Vehicle Acquisition

- E6.1Safety considerations include:
  - Suitability for designated purpose
  - Crashworthiness
  - Cargo capacity and load position
  - Ergonomic considerations such as:
    - Ease of access, egress, movement within and ability to work fromin the vehicle
    - Specifications based on weight, size, and configuration of cargo to be loaded/unloaded that will: minimize forward bending and contact stress with the bumper; reduce extended reaches; and allow loads to be lifted close to the body
  - Safety features such as:
    - ABS
    - Front and side airbag systems
    - Stability systems
    - Rear vision or detection devices
    - Collision avoidance devices
    - Event data recorders
    - Night vision devices
    - Exterior mirror systems

Vehicle Inspection & Maintenance

- 6.4 Vehicle Inspection.
  - Vehicles shall be inspected, at a minimum, in accordance with the vehicle manufacturer's recommendations, regulatory requirements, and recognized standard practices.
- 6.5 Periodic Vehicle Checks.
- 6.6 Vehicle Maintenance.
- 6.6.1Scheduled Maintenance.
- 6.6.2Repairs.
- 6.6.3Qualified Automotive Service Personnel and Facilities.
- 6.7 Vehicle Replacement.
  - Organization-operated vehicles shall be replaced periodically based upon formal procedures.
  - Factors affecting the need for vehicle replacement include:
    - Total mileage
    - Maintenance cost and frequency
    - Condition of vehicle
    - Operational requirements
    - Operating environment
    - Hours of service
    - Safety of vehicle

Incident Reporting & Analysis

- 7.1 Reporting of Vehicle Incidents and Collisions.
  - Incident and collision reporting procedures shall be developed and followed to collect information sufficient to support analysis and review of motor vehicle incidents, for the purpose of taking corrective action to prevent future incidents.
- 7.1.1 Organizational Responsibilities
- 7.1.2 Driver Responsibilities.
- 7.2 Incident Review and Analysis.
  - A process shall be developed to systematically review and analyze incidents. The objective of this process is to identify the root cause and any contributing factors that led to the incident, to prevent future occurrences.
- 7.2.1 Analysis of Causal and Contributing Factors.
- 7.2.2 Determination of Preventability.
- 7.2.3 Incident Review Report.
  - Incident reviewer(s) shall prepare and deliver a report to persons with authority to implement the changes necessary to prevent the incident from recurring. The report shall document the causal and contributing factors for the incident.

Incident Reporting & Analysis

- 7.2.4Corrective Action for Incidents Preventable by the Driver.
  - For incidents determined to have been preventable by the driver, corrective actions shall be developed and implemented in a timely manner. Records shall be kept to verify that the prescribed action was taken.
- 7.2.5Corrective Action for Other Factors.
  - Corrective actions shall be implemented to address factors related to the driver, the vehicle, or the operating environment. Records shall be kept to verify that the prescribed action was taken.
- 7.3 Data Analysis.
  - Organizations shall collect data needed to calculate rates for tracking safety performance over time. Organizations shall identify the most appropriate rates based on patterns of vehicle use and the nature of motor vehicle operations.
- 7.3.1Motor Vehicle Incident Rates.
  - Incident rates shall be used to measure the historical frequency of incidents or collisions.
- 7.3.2Reporting Periods:
  - Incident rates shall be continuously maintained in order to compare with historical or industry experience and to track progress over time.

Incident Rates

- Incident rate based on number of vehicles operated:
  Incident rate = Number of incidents x 100 / Number of vehicles
- Incident rate based on vehicle mileage:
  Incident rate = Number of incidents x 1,000,000 / Vehicle mileage
- Injury incident rate based on vehicle mileage:
  - 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.

  Injury incident rate = Number of incidents with injury x 1,000,000 / Vehicle mileage
- Incident rates based on service activity:
  - Motor vehicle operations that pose injury risks other than those associated with driving should also use the service activity as the basis of a safety performance rate. The number of deliveries, stops, or loads should be considered as appropriate indicators of performance.

  Incidents per 10,000 transports = Number of incidents x 10,000 / Number of transports
- Vehicle injury rates based on work hours:
  Vehicle incidents per 200,000 hours = Number of incidents x 200,000 / Number of hours worked

Education

- Where does ambulance safety feature in EMS education programs – we do know now that it is biggest threat to a medics life and wellbeing

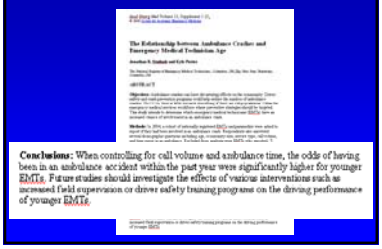
What are the solutions?

- Training?
- Practice Policy?
- Transportation Systems Engineering?
- Automotive Engineering?
- Education of other road users???

The Driver

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

Driver issues



The Relationship between Ambulance Crashes and Emergency Medical Technician Age

Conclusions: When controlling for call volume and ambulance time, the odds of having been in an ambulance accident within the past year were significantly higher for younger EMTs. Future studies should investigate the effects of various interventions such as increased field supervision or driver safety training programs on the driving performance of younger EMTs.

…as he had been trained to do…??

Sides differ on who ran red light in ambulance wreck that killed teen - Alabama

Assistant District Attorney Robert Becher told the jury today in his opening statement that Tennessee ambulance driver Charles Christopher Eakes was speeding and ran a red light when he collided with Dianna Bowden at U.S. 231/431 and West Limestone Road.

But Eakes' lawyer, Robert Presto, said in his opening argument that Bowden ran the red light and darted into the path of the ambulance.

Bowden, 18, was killed in the wreck Oct. 13, 2005, about seven miles north of Huntsville in Hazel Green.

Troopers estimated that Eakes was driving 81 mph in a 60 mph speed zone. But Presto said Eakes had slowed to about 50 mph to go through the intersection, as he had been trained to do.

When the crash occurred, the ambulance was transporting a patient, Ernest Cook, to Huntsville Hospital from Fayetteville on a non-emergency basis.

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. Levick, MD, MPH
Maimonides Medical Center

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

Nadine Levick
Objective Safety LLC
United States of America
Larry Wiersch
Michael E. Nagel
Catonia Ambulance
United States of America
Paper Number 05-0234

The "Feedback 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

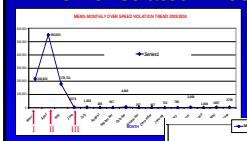
Purpose of 'Feedback box' Program

- 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

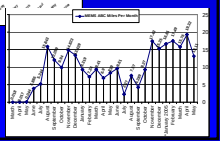
Demonstrated Effectiveness



I – blind data, no growls

II – growls & tones ON unidentified data capture

III – identified data



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

Implementation

- Company meetings in Nov 02
- Installed in Mar 03
- Blind data collection thru mid April
- Growls and tones turned on – no key fobs
- Fully deployed in June 03
- Company divided into teams for free lunch
- NO PERFECT DRIVERS WANTED

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

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

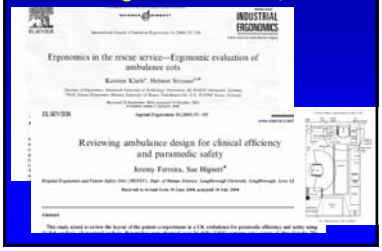
You want a system that works!!

- Does the system really work
- Is it going to be a major burden on your staff to implement
- What are the real costs
- Are you going to have video of your company vehicle on you tube??

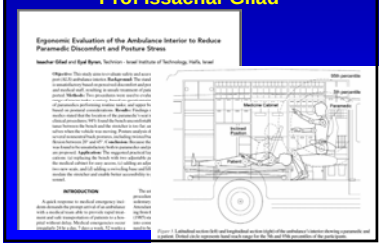
The jury is out on

- Opticon
- Simulators

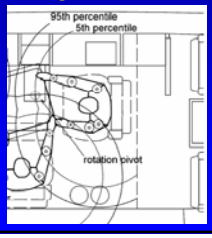
EMS Ergonomics 2005, 2006



December 2007 Prof Issachar Gilad



Range of reach



Ergonomics issues Gilad 2007

- *"It seems that the interior design is based primarily on spatial utilization, with little concern for ergonomics. Based on the data and observations of how work is actually performed in the ambulance interior working cell by the variety of personnel who participated in this study, we suggest a few guidelines to enhance the interior design. We believe that these suggestions can reduce the uncomfortable and extreme postures indicated in this study."*

Under Way…
Emergency Vehicle Visibility and Conspicuity Study

- Funded by the USFA conducted by IFSTA
- Looking at the effectiveness of reflective markings used on emergency vehicles
- Doing best practice research and working with manufacturers

Recent Visibility Webinar
www.GlobalEMSForum.org

Safety for emergency transport

Policy that reflects SCIENCE

Air EMS is a role model for safety initiatives and focus

Air and Ground EMS

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

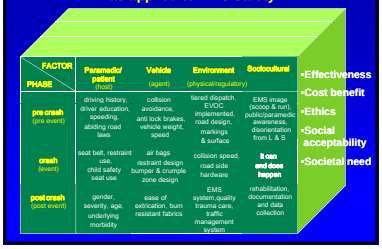
An Aviation Safety Plan

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 ?

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



Global EMS Vehicle Safety Standards v Specifications and Guidelines

- EMS Safety and Performance Standards
  - Australia & New Zealand 4535
  - Common European Community (CEN) EN1789
- Non EMS Specific USA Standards
  - [Aviation - FAA/CAA/JAA]
  - Z15 – Fleet vehicles safety management
- USA EMS Specification & Guidelines
  - Purchase Specification: KKK & NTEA – AMD
  - Guideline: EMSC Dos and Donts
    ASTM, CAAS and CAMTS

Australia & New Zealand Ambulance restraint standard AS/NZS 4535:1999

- "Restraint systems shall apply to all equipment and people carried in an ambulance…"
- Dynamic Testing - 50th & 95th percentile manikins
- 24G in Forward and Rearward
- 10G in Transverse

Common European Community (CEN) EN 1789:1999/A1:2003,

European Committee for Standardization

Medical vehicles and their equipment - Road Ambulances

- "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 ambulance purchase specifications GSA:KKK-A-1822F, Aug 2007

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

AMD 2007 – 'safety testing'

- Ignorant of automotive safety principles – and specifies that a 'successful test' is -
  - 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.

Some KKK spec info

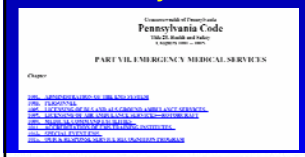
- Text detail:
  - lighting systems
    - 151 lines of text, 2 tables and a diagram, over 5 pages
  - preparation of painting, color and markings
    - 107 lines of text, 1 table, over 3 pages
  - protection of patients and crew
    - 2½ lines of text

Commission on Accreditation of Medical Transport Systems - CAMTS Accreditation Standards

Seventh Edition, January:2006

camts

Pennsylvania Code



Commonwealth of Pennsylvania

Pennsylvania Code

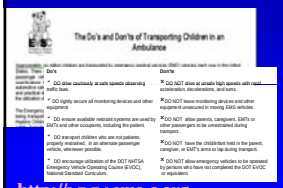
Title 25. Health and Safety

PART VII. EMERGENCY MEDICAL SERVICES

Chapter

Transport Safety Guidelines

EMSC/NHTSA fact sheet and AAP Text



The Do's and Don'ts of Transporting Children in an Ambulance

Do's

- DO drive cautiously at safe speeds observing traffic laws.
- DO tightly secure all monitoring devices and other equipment
- DO ensure available restraint systems are used by EMTs and other occupants, including the patient.
- DO transport children who are not patients, properly restrained, in an alternate passenger vehicle, whenever possible.
- DO encourage utilization of the DOT NHTSA Emergency Vehicle Operating Course (EVOC), National Standard Curriculum.

Don'ts

- DO NOT drive at unsafe high speeds with rapid acceleration, decelerations, and turns.
- DO NOT leave monitoring devices and other equipment unsecured in moving EMS vehicles.
- DO NOT allow parents, caregivers, EMTs or other passengers to be unrestrained during transport.
- DO NOT have the child/infant held in the parent, caregiver, or EMT's arms or lap during transport.
- DO NOT allow emergency vehicles to be operated by persons who have not completed the DOT EVOC or equivalent.

http://www.ems-c.org
http://www.nhtsa.dot.gov

TRB TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

Knowledge Transfer

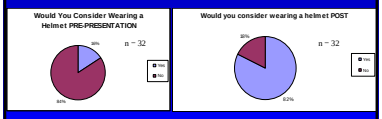
(July 2007)

- Commercial Motor Vehicle Driver Training Curricula and Delivery Methods and Their Effectiveness
- Commercial Motor Vehicle Carrier Safety Management Certification
- The Role of Safety Culture in Preventing Commercial Vehicle Crashes
- The Impact of Behavior-Based Safety Techniques on Commercial Motor Vehicle Drivers
- Health and Wellness Programs for Commercial Motor Vehicle Drivers

NAEMT July 2006 Position statement

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

Preliminary Study: Attitudes to Head Protection in EMS



Risk Awareness before & after a 1 hour presentation

	Pre %	Post %	P value
Perception of the rear compartment as a high risk for serious injury	43	76	<.0001
Likert Score* of 10, (10=highest) for the concern for safety in the rear of the ambulance	36	72	<.0001
Self-report of always wearing a seat belt	14	19	NS
Considering wearing a limited motion safety harness	81	97	<.0001
Wearing a helmet in the patient compartment	31	81	<.0001

* Likert Score for safety concern, increased from a median of 8 pre to 10 post, p<.0001

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…

Gets caught and scratched

New EMS helmet prototypes for 2008

R & D
"Ripoff and Duplicate"

- Avoid reinventing the wheel at all costs
- Where are the best practices that we need to transfer knowledge from

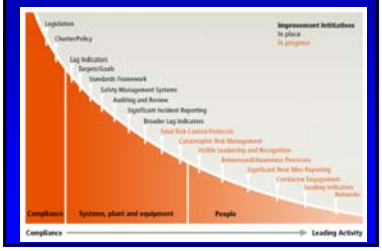
UPS: The 'Big Brown'

- 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



FMCSA - safety mandate

- Develops and enforces data-driven regulations that balance motor carrier (truck and bus companies) safety with industry efficiency
- Harnesses safety information systems to focus on higher risk carriers in enforcing the safety regulations
- Targets educational messages to carriers, commercial drivers, and the public
- Partners with stakeholders including Federal, State, and local enforcement agencies, the motor carrier industry, safety groups, and organized labor on efforts to reduce bus and truck-related crashes.

FMCSA - Exceptions

- Unless otherwise specifically provided, the rules do not apply to —
  - (f)(1) All school bus operations as defined in §390.5;
  - (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;

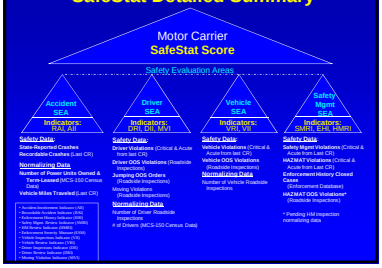
Motor Carrier Management Information System (MCMIS)

- FMCSA operates and maintains the MCMIS
- MCMIS contains information on the safety fitness of commercial motor carriers
- MCMIS is a collection of safety information including state-reported crashes, compliance review and roadside inspections results, enforcement data, and motor carrier census data
- The Crash Profiles use the National Governors' Association (NGA) recommended data elements reported to FMCSA by states through the SAFETYNET computer reporting system

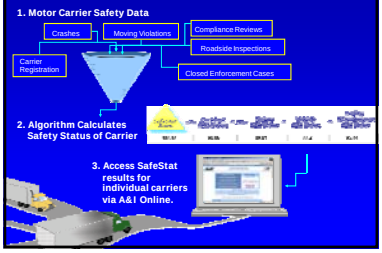
MCMIS - NGA reportable crash

- **Must involve:**
  - a truck (a vehicle designed, used, or maintained primarily for carrying property, with a gross vehicle weight rating or gross combination weight rating of more than 10,000 lbs.) or
  - bus (a vehicle with seats for at least nine people, including the driver)
- **The crash must result in:**
  - at least one fatality
  - one injury where the person injured is taken to a medical facility for immediate medical attention; or
  - one vehicle having been towed from the scene as a result of disabling damage suffered in the crash.

SafeStat Detailed Summary



How are SafeStat scores calculated?

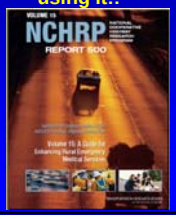


FMCSA - Hours of Service Regulations

FMCSA HOS – detailed info

Tips for Emergency Vehicle Operations

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



Safety leadership… from the IAFC and USFA

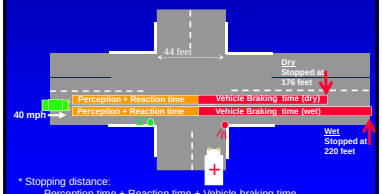
An excellent model

http://www.EveryoneGoesHome.com

16 Firefighter Life Safety Initiatives
www.EveryoneGoesHome.com

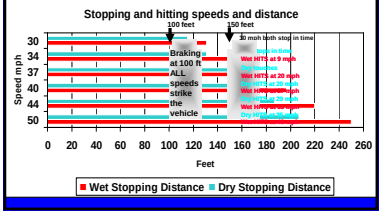
1. Define and advocate the need for a cultural change relating to safety; incorporating leadership, management, supervision, accountability and personal responsibility.
2. Enhance the personal and organizational accountability for health and safety.
3. Focus greater attention on the integration of risk management with incident management at all levels, including strategic, tactical, and planning responsibilities.
4. All must be empowered to stop unsafe practices.
5. Develop and implement national standards for training, qualifications, and certification based on the duties expected to perform.
6. Develop and implement national performance related medical and physical fitness standards.
7. Create a national research agenda and data collection system
8. Utilize available technology to produce higher levels of health and safety.
9. Thoroughly investigate all fatalities, injuries, and near misses.
10. Grant programs support the implementation of safe practices and/or mandate safe practices as an eligibility requirement.
11. Develop national standards for emergency response policies and procedures
12. Develop national protocols for response to violent incidents..
13. Must have access to counseling and psychological support.
14. Public education must receive more resources and be championed
15. Advocacy for the enforcement of codes and the installation of home fire sprinklers.
16. Safety must be a primary consideration in the design of apparatus and equipment.

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



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

They CANT STOP IN TIME
Even at 30 mph & 100 feet away
- dry and wet conditions-



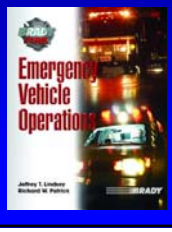
EMS is emerging in the transport safety arena

- 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

USFA Emergency Vehicle Safety Initiative

VFIS Summer 2006

Where is transport research ?



Fleet Mix ?

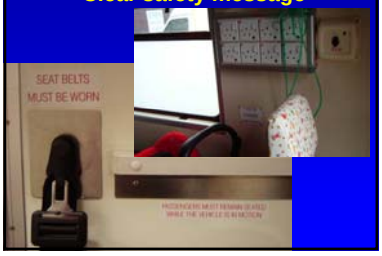
For your current fleet

- 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 "Feedback Boxes"
- Monitor crash events with common denominators (ie. per 100,000 miles and per trip)

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

Clear safety message



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

And….

- It is no longer acceptable for EMS to be functioning outside of transportation, automotive and PPE safety standards for prevention of and protection of EMS providers, patients and the public from injury and death