The Ride of Your Life – Safety Strategies and Solutions

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?
- What can we learn from international colleagues?

Who am I?
- Nadine Levick MD, MPH
- Emergency Medicine Physician and Public Health Academic, (USA-Hopkins, Harlem, Maimonides, Brookdale & Australia – Royal Melbourne, Royal Childrens Hospitals, Royal Australian Flying Doctor Service)
- Chair, National Academies Subcommittee TRB EMS Transport Safety, USA
- Founder of EMS Safety Foundation
- Recipient, International Society of Automotive Engineers, Women’s Leadership Award for EMS Safety

The 2012 TRB EMS Safety Summit

- Opening Address: A.J. Heightman
- Safety Developments Update – N. Levick
- Research needs assessment forms explained – E. Frazer

1: Data and Recent Initiatives
2: Transport, Human Factors - Bridging Diverse Disciplines
3: Testing and Standards
4: New systems safety technology solutions & telematics
5: Fleet management strategies
6: Innovative Vehicle Design
7: Operationalizing Safety
8: Panel: How to optimize the safety of your existing fleet

Wrap up – from Prof. Art Cooper

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
Your electronic handout

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Your Handout and Additional Resources

Your handouts etag page

for those not of the Y or @ generation!
- if you have a smart phone
- and you have downloaded free Tag Reader
- point your phone and capture this etag to get today’s handout on your phone

Provider and Pt die, Jan 13, 2012

Ambulance Crash Kills Two, Seriously Injures a Third

February 4, 2012

Several injured in Pike County ambulance crash - Kentucky

March 23, 2012

Ambulance, Fire Truck Collide In Baltimore
TRB 2012 Summit – addressed the key and interdisciplinary applied solutions issues, in one day – please seek that information out. www.objectivesafety.net/TRBSummit2012.htm

There have been two prior TRB Summits held, 2008, 2009 and both with vehicle engineering and transportation systems technical expertise

See www.trb.org, and for the Summit archives:
www.objectivesafety.net/TRBSummit2008.htm
www.objectivesafety.net/TRBSummit2009.htm

National Academies Transportation Research Board
2012 EMS Safety Summit

- One Day event, 30 presentations
- Held in Washington DC, Keck Center
- Simulcast Live to EMS Today
- Live Webinar Access - globally
- Over 100 participants live across 3 continents
- Greater that 10,000 downloads of handouts within the first week!!
Thank you to all our speakers and moderators

Opening Address – AJ Heightman
**Rules/Policies Addressing Known Hazards**

- **Federal Motor Carrier Safety Administration (FMCSA)**
  - Cell phone use – November 2011
  - Hours of Service – December 2011

**Nov 2011, Hand Held Cell Phone Ban**


**Dec 2011, New FMCSA Hours of Service**

[Link to FMCSA Hours of Service regulations](http://www.fmcsa.dot.gov/rules-regulations/topics/hos/index.htm)

**New Fleet Operations Standards**

- ISO 39001
- ANSI/ASSE Z.15

**New Vehicle Standards**

- NFPA 1917

**New Equipment Mounting Testing Standards**

- SAE 2917, 2956

**Change and Innovation**

- Improved data systems for injury
- Enhanced data on denominator
- New technologies
- New policies/standards
- Interdisciplinary collaboration
New Safety Data
- TRB 2012
- 2011 National EMS Assessment
- 2011 NFPA
- TZD EMS
- NCHRP 17-51
- FARS/MMUCC
- NEMSIS
- BLS

National EMS Assessment
December 2011

NFPA Data Systems Analysis
November 2011

Fatal injuries among EMTs and paramedics, 2003-2010*
- Aircraft incidents: 34%
- Highway incidents: 32%
- Struck by vehicle: 7%
- Other transportation incidents: 7%
- Assaults and violent acts: 8%
- Other: 11%
Total = 97
* Data for 2010 are preliminary. Percents may not add to 100 due to rounding.

Survey of Occupational Injuries and Illnesses (SOII)—Nonfatal data
- Data obtained from an establishment survey based on OSHA recordkeeping logs.
- National data prior to 2008:
  - Cover private wage and salary workers only
  - Exclude volunteers unless compensated
- Data for 2008 and beyond:
  - Include paid State and local government workers
- Case and demographic characteristics:
  - Available for cases with days away from work only

Cases with days away from work among EMTs and paramedics, 2010
- In lifting: 38%
- Bodily reaction: 9%
- Other overexertion: 11%
- Other: 8%
- Transportation incidents: 8%
- Contacts with objects or equipment: 8%
- Total = 8,360

Number of days away from work among EMTs and paramedics, 2010

- 31 or more: 10%
- 21-30 days: 24%
- 11-20 days: 4%
- 6-10 days: 10%
- 3-5 days: 16%
- 1 day: 22%

Total cases = 8,360
Median = 6 days away from work

Federal Agency Update

- NTSB – www.NTSB.gov
- FEMA - www.FEMA.gov
- DHS/NIST/NIOSH – www.NIST.gov
- NHTSA/NEMSAC - www.EMS.gov
- CDC – www.CDC.gov

Course Design

- One-day program
- Interactive lecture, discussion, group activities
- Case studies using real incidents
- 8 hours continuing education credit (CECBEMS)
- Presented in 8 modules
First-year Progress
(Course Rollout @ EMS Today, March 2011)

- 11 State and National Courses conducted
- 214 Local & Regional courses held
- 1,445 EMS Practitioners trained
- 401 Instructors certified
- Active programs in 30 states

Japanese Paramedic Association
Tokyo, Japan
December 17, 2011

A special recognition for
Japan April 2012

- The Japan Paramedic Association awarded honorary membership of the EMS Safety Foundation’s Innovation Consortium 2012
- Japan is the first Paramedic Association in Asia to participate in the Innovation Consortium
- Mr. Giko Suzuki, of Japan Paramedic Association demonstrated leading edge vision by bringing the NAEMT Safety Course to Japan and having it translated to Japanese

NAEMT EMS Safety Course

For more information about the course, including how to find a class in your area or to sponsor a class

call 1-800-346-2368
(1-800-34NAEMT)
or email info@naemt.org

Culture – “the way we do things around here”
Organizational culture is defined by its mission, vision and values

Organizational Safety Culture: we want a culture that inspires employees and managers to work together to achieve organizational goals and expectations in a cohesive, safe and progressive manner.

Key elements of organizational safety culture:
- I. Informed Culture
- II. Just Culture
- III. Flexible Culture
- IV. Learning Culture
In Summer 2012 – ASHGATE will publish a CAMTS reference entitled: “Safety and Quality in Medical Transport Systems: Creating an Effective Culture”

ACTIVE SAFETY
AVOIDS THIS:

AMBULANCE DESIGN CHALLENGE
Seated and Restrained, But can you get the job done?

BRIDGING the GAP
BASIC PRINCIPLES: ERGONOMICS
- Maintain Health (Safety) and Productivity
  - Bio Metric Range of Customers
  - Seated when traveling
  - Task Analysis / Performance
    - Provide resources required
    - Appropriate range / motion
    - Appropriate strength
    - Maintain task forces below injury levels
    - Repetitive events

BASIC PRINCIPLES: AUTO SAFETY
- Prevent Accidents, Minimize Consequences
  - Bio Metric Range of Customers
  - Seated when traveling
  - Passive Safety
    - Restrain occupants in seats
    - Maintain seat integrity
    - Maintain passenger compartment integrity
    - Minimize deceleration forces
    - Provide crush zones
    - Provide friendly surfaces at impact zones
    - Maintain force levels below injury levels
    - Singular events

Bridging Ergonomics, Operational Task Analysis and Automotive Safety

Chris Fitzgerald (Ergonomist)
Ergonomics

- ...interactions of humans within a system.
- ...optimizing human well being and system performance.
- Iterative approach - there are benefits to be had!
- Key (physical) factors:
  - Task analysis – what people do
  - Anthropometry – body size
  - Biomechanics – human movement
- Other factors:
  - Lighting, air quality and thermal comfort
  - Usability and cognition

Task analysis – what people do

- Operational task analysis
  - Defining what people (paramedics) do
  - Develop and test designs that optimize paramedic / patient / equipment placement and performance
- ... in practical terms tasks analysis defines the system
- Can be conducted prospectively for all known or anticipated interactions (you end up with a lot of data)
- Once task behaviours are known design consideration for safety and efficiency can be made and tested
- Task analysis should involve “operators” and represent a true description of what is done

Anthropometry – Body Size

- Who are we designing for?
  - Patients
  - Paramedics and other occupants
- Need to accommodate full range of the population
  - Gender (to reflect workforce participation rates)
  - Body size
  - Functional task performance and biomechanics

Gender / Body Size

Two Women: Same Sitting Height
Side View 3-D Scans

Automotive Safety the basics

- Ergonomics design to occur within the context of automotive occupant safety principles:
  - Forward / rearward facing seats
  - No side facing seats (during transit)
  - Restraint of all persons at all times
  - Restraint of equipment (at least 10 G in all directions + 20 G in forward direction)
- Design challenge:
  - Fitting the users, occupants and equipment
  - Create accessibility to equipment / tasks
  - Retaining these occupant safety principles
  - Ultimately, this requires mobility with the ambulance

Summary

- Effective application of ergonomics can help to define the system in a meaningful and useful way
- Task analysis
- Anthropometry
- Functional task performance / biomechanics
- In the context of inherent automotive safety and occupant protection needs
- Creative designs that orient the users and occupants safely, provide mobility within the ambulance while people and objects are restrained.
Information and Technology Transfer

- New Tools
- New Collaborations
- New Platforms
- New Events
- New Organizations
- Webinar, Podcasts, Blogs, Skype and Twitter

Increasing focus

- TRB - ANB10(5)
- RITA/ITS/DOT
- Traffic Records Forum
- DHS/NIST/NIOSH
- TIMS
- ASSE
- SAE
- EMS Safety Foundation

Interdisciplinary Innovation Consortium

Rettmobil 2011 – May 11-13th

Small AED
Summary

- Collaboration
  - Interdisciplinary
  - Interagency
  - International

Fleet and Vehicle Standards

- Fleet
  - FMCSA/Exemptions
  - ANSI/ASSE Z.15
  - ISO 39001 – December 2012

- Vehicle
  - AMD
  - KKK
  - NFPA
  - ASTM
  - FMVSS
  - SAE
  - International - CEN/ASA

Federal Motor Carrier Safety Administration - FMCSA

- http://www.fmcsa.dot.gov/

American National Standard

ANSI/ASSE Z15.1-2006
Safe Practices for Fleet Motor Vehicle Operations

NFPA 1917

National Fire Protection Association
The authority on fire, electrical, and building safety
Vehicle Safety Dynamic Testing Types

- Deceleration Sled Tests (not usually a full vehicle) – no intrusion
- Barrier impact tests – intrusion
- Full vehicle to vehicle tests – intrusion
- Computer predictive modeling - must be based on real world injury and vehicle crashworthiness data

International Ambulance Design Safety and Occupant Protection Standards

- In existence since 1999
  - Australia – ASA
  - Europe - CEN

Ambulance Standards and Testing

- KKK A 1822F: Purchasing Guideline
  - “Minimum Specification and performance parameters”
- AMD-001-025: Manufacturing Guideline
- ASTM F2020-02a: Standard Practice
  - Soon to be released
Dispatch Systems, Basic to Cutting Edge
- IT and Communication System
- Direct Relationship to Safe Vehicle Operations
- Community Needs
- Public Safety Integrated Systems
- Reporting Integration
- Instruction Help to Callers

EMS Safety Foundation
www.EMSSafetyFoundation.org

Major Challenges
- Unpredictable Callers
- Time Limitations
- 911 Calls in the Public Domain (should be Privileged and Confidential)
- Call Locating with the Challenge of Mobile Phones
- Can’t use Text, SMS, Twitter…

Solutions
- Call Taking Assistance
- Resource Management to Reduce Time to Response and Get Appropriate Response with Minimal Duplication
- Support for Medical Mgt and Transport
- Training the Community

Response, Emergency Staging, Communications, Uniform Management, and Evacuation (R.E.S.C.U.M.E.)

Linda D. Dodge
ITS Joint Program Office, US DOT

EMS Safety Foundation
www.EMSSafetyFoundation.org

Overview
- USDOT ITS Program Background
- Traffic Incident Management & ITS
- Mobility Program
- NG9-1-1 Status
- R.E.S.C.U.M.E. Status and Plans

EMS Safety Foundation
www.EMSSafetyFoundation.org
ITS Research Program

Safety
- V2V
- V2I
- Safety Pilot
- Real-time Data
- Human Factors
- Systems Engineering
- Certification
- Test Environments

Mobility
- Mobility Applications
- Harmonization of International Standards & Architecture

Environment
- Data Sharing
- Road Weather Applications
- Road Weather Applications

Technology
- Deployments Scenarios
- Operations & Governance
- Institutional Issues

Policy
- Mobility
- Real Time Data Capture & Management
- Dynamic Mobility Applications

Next Generation 911 Initiative

Long Term Goal:
To enable the general public to make a 911 “call” (any real-time communication – voice, text, or video) from any wired, wireless, or Internet Protocol (IP)-based device, to the PSAP, and enable data sharing with the emergency communication network

Major Milestones:
- National architecture and high-level design for NG911 System
- Proof of Concept Demonstration
- Transition plan for NG9-1-1 implementation

For More Information

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Medavie EMS
Island EMS

Code 1 Speed Restriction Policy

The Policy

- Medavie EMS implemented a policy for its staff that restricted paramedics from drive no more than 10 km over the speed limit during an emergency call except when in four lane 100 series highways were they were permitted to exceed the speed limit by 20 km/h over the posted speed limit.

- One of the main reasons that the policy was implemented was that the evidence showed responding to emergencies with higher speeds meant greater risk, and the time saved was not worth the risk to the staff, patients, and public.

The reactions

News Media
Solution?

- Better Communication to stakeholders, staff and members of the public
- Education on the risks of vehicle safety
- System Solutions not just policies
- Time – remember when this was normal?

Impaired/Distracted Driving/Hours of Service

1. Driver Fitness – background checks and driver selection standards – goal rule out unfit drivers
2. Impairment – not just drugs/alcohol also fatigue and distraction
3. Hours of Service- learn from FRA, TRA & DOT limits
4. Distracted Driving – focus on driving

Distracted Driving

- Distracted driving is any activity that could divert a person's attention away from the primary task of driving.
- Effects of cell phone use:
  - delays reaction time as if you had .08 blood alcohol concentration,
  - increases crash chances by 4X for handheld phone & 23X by Texting

Types of Distraction:

- Visual – takes your eyes off road.
- Cognitive - takes your mind off the road
- Manual - takes your hands off the wheel
- Auditory - takes your focus off the road
- Tasks that can be a driving distraction often fit into more than one category.

DOT HOS Rules

- Limits established for on-duty hours
- Establishes minimum levels of off-duty time-8 hours if on duty less than 12 hours FRA or if over 12 hours then 10 hour off-duty time
- Commercial airline pilot can fly up to 100 hrs/month
- Adopts 60/70 hour weekly maximum for truck drivers, 10 hour off-duty time
Summary

- **Systems** –
  - Evaluate your level of fleet safety systems in your service for Fatigue Mgmt, Driver Fitness, & Focused Driving

- **Strategies** –
  - Increase focus on fleet safety to same level as patient and employee safety

- **Solutions** –
  - Audits, Perception Survey to address behavior change in all levels of organization, Education, & use of Technology

A lot is now possible and for less!

- Driver behavior
- Vehicle behavior
- Roadside ITS
- Fuel consumption/Economics
- Resource modeling

Fleet Management technologies

- ACETech/Ferno
- FleetEyes – Intermedix
- Zoll rescuenet and roadsafety fleet management systems
- Marvlis
- Telematicus
- Optima
- Northrop Grummen

Spectrum of dimensions

- CAD
- Resource allocation
- Fleet performance –
  - Monitoring: System that gives management data of vehicle efficiency and use
  - Feedback: Directly to drivers at the wheel
- Public Alerts

Fleet Safety Solutions

- Policies and Programs
  - Road Safety – Vehicle Monitoring System
  - Threshold Events measured against miles driven
  - Individual and Operation Driver Reporting

Monthly Driver Reports

- Identifies high risk behaviors
- Provides real time feedback to driver
- Provides reports for employee evaluation
Measuring Our Success at Sunstar Paramedics

Summary

Through these technologies:

- We realized dramatic change in our drivers attitude toward safety
- We have evidence based data to use for individual driver training and refresher courses
- We are able to identify drivers that fail to align themselves with our mission of safety

Safety System (Integrated into AVI)

- Speeding infractions, Unbelted, Unsecured occupants
- Lights and siren compliance
- Create Driver Safety Reports- provide feedback to employees
- Set pre-defined speed limiters

Call Details

Niagara – Acetech Integrated Vehicle Intelligence System

Fully integrated, vehicle performance monitoring and control system with on-board intelligence.

- Safety Systems
- Eco-Run Module Benefits
- Asset Protection Benefits

Niagara EMS Decrease in Speeding Infractions
Innovative vehicle technical aspects
- Sprinter Ambulances Provide Safer Environment/Retain Automotive Safety Features
- Forward Facing Seats Critical
- Reach Patients from Belted Position
- Leadership, Communicate, Culture, Vehicle, Accountability
- Science & Data Based

Intervals Based on European and Canadian Specs Which Meet Gov’t Safety Standards

The Motorcycle Medic
- In almost ¼ (23.5%) of all motorcycle missions ambulance use was avoided!

Ambulance Sparing

The Motorcycle Medic

Integrating Ergonomics, Automotive Safety and Cost Efficiency
“designing medical interiors for optimal safety”

Chris Fitzgerald (Ergonomist)
“Systems” approach

- Incorporation of ergonomics in ambulance design reflects a systems approach
- Accommodation of people, equipment and resources occurs in the context of a range of interactions and a need to establish and maintain minimum safety
- Ergonomics and automotive safety requirements can be used to define the system
- Efficient, safe and functional design should deliver cost efficiencies (vehicle operation, human resources and equipment)

Seating – beside patient

- Forward facing seats only
- Mobility of the seat forward / rearward and sideways (if needed) and stretcher an advantage
- Paramedic restrained
- Paramedic can access equipment and patient during transit while restrained
- Head impact zones avoided or minimised

Seating – at head end of patient

- Forward facing seats only
- Mobility of the seat forward / rearward
- Paramedic restrained
- Paramedic can access equipment and patient during transit while restrained
- Head impact zones avoided or minimised

Summary

- Effective application of ergonomics can help to define the system in a meaningful and useful way
- Consider operational tasks away from the ambulance to ensure equipment is accommodated
- Consider operational tasks and equipment use within the ambulance for design success
- Design within the context of inherent automotive safety and occupant protection needs
- Creative designs that orient the users and occupants safely, provide mobility within the ambulance and enable people and objects to be restrained.

Peds and Neonate Transport

- Special population
- Unique challenges
- Potential pitfalls
- Innovative approaches
  - USA
  - Internationally
It is a SYSTEM!

- Child in a vehicle with other occupants and equipment
- Vehicle in a Fleet
- Fleet in a region

Melbourne, Australia Neonatal Ambulance – in transit mode

Pittsburgh, Pediatric Transport Ambulance USA

Safety

- Vehicle
  - All electronic safety systems:
    - A-ESP, ABS, etc.
  - Crashworthiness:
    - Original chassis
    - Seat belt tensioner
  - Internal passive safety
    - Impact zones
    - No sharp edges
    - Securing equipment

User friendly

- All necessary equipment should be reach from the seats without losing the seat belt
The stretcher platform can be moved into 3 different positions

Lesson learned

- We are quite sure that nobody died or was injured because of our actions, but there are several issues that need to be improved
- Risk assessments and plans has to be revised
- Our logistic organisation need to be re-organized
- We have started a project to organize a special operational group that can execute USAR and work under CBRN condition

Lesson learned, communication

- There was a computer integration failure in our control room
- The new TETRA radio system worked perfect in Oslo
- Old VHF-radio system at Utøya
- Some problems with data communication between the ambulances and the control room
- At Utøya the young people used new ways of communication; Twitter, Facebook, SMS, MMS, mail etc. from their mobile devices
- Many called mom and dad. They called their local emergency services
- The mobile phone system was in some periods used at 100%
- Some local control rooms had too few operator(s) on duty

What Air Medical Can Teach Us

I. Policies and Practices
II. Learning for Our Mistakes
III. Fatigue Mitigation
IV. Safety Management Systems
V. AMRM
Air Medical Resource Management - AMRM

CRM specific to air crews and includes:
- Communication processes and Decision Behavior
  Briefings
  Inquiry/advocacy/assertion
  Crew self critique
  Conflict resolution
- Team Building and Maintenance
- Workload management and Situation Awareness

Summary

We can learn from each other: Ground and Air - we are all moving while caring for patients.
Safety vigilance for ground is just as important as for air.
We need the data for ground incidents and accidents in one strategic location so we can track, trend and analyze as we do for air accidents to mitigate the risks and hazards.

Untapped Opportunities: Resource Utilization

- Emergency medical dispatch is a critical gatekeeper for resource allocation and distribution
- Paramedic versus emergency medical technician
- Air medical versus ground transport
- Critical care ground transport units
- Traffic and bystander management

DATA: EMS IS NOT AN ISLAND

- Impact of formally trained emergency medical dispatchers on resource utilization and patient outcomes
- Impact of mandatory restraint use on EMS personnel and patient injury patterns
- Fatalities
- Inclusion of EMS in traffic incident management plans/drills

Relative benefit: Data Sharing Between PSAPs, the Scene, Emergency Response and Hospitals

- Predictors of Injury Severity
- Mobile Apps
- Route selection & guidance
Model Inventory of Emergency Care Elements “MIECE”

Example of how a MIECE color-coded road map might appear:
- Green = high level of emergency care resources
- Yellow = medium level of emergency care resources
- Red = low level of emergency care resources

BENEFITS SQUARED
- Improvements to EMS overall as a transportation mode
- Improved outcomes for patients with time-urgent conditions
- Advancements in telemedicine & teletrauma
- Benefits Cubed: Counterbalancing the rural disparity

The Panel

The Panel

Wrap Up

- What’s old in EMS safety?
  - Inadequate funding (old equipment)
  - Inadequate training (esp volunteers)
  - “We’ve always done it this way”
- What’s new in EMS safety?
  - Exponential growth in teleinformatics
  - Better vehicle, system engineering
  - Increasing awareness, safety culture

Wrap Up

- “Signal” research we can do now
  - Which calls truly need a hot response?
    - High performance simulators may help
  - How much time do L&S really save?
    - Apocryphal California “Yellow cab trial”
  - True cost benefit analysis of L&S use
    - How many lives/dollars are saved/lost?
  - Which patients may be eligible for T&R?
    - Leverage HCP-EMT telecommunications
Summary

- Systems
  - Physical Factors
  - Human Factors
- Strategies
  - Imagination, Innovation
  - Leadership, Followership
- Solutions
  - Vehicles, Ergonomics
  - Informatics, Telematics

Safety of the...

- Provider
- Public
- Patient

Some questions for you all:

- Have you ever been in a EMS crash?
- How many times?
  - 1?
  - 2?
  - More?
- Have you ever been hurt in an EMS crash?
- Do you know any one who has ever been hurt in an EMS crash?
- Do you know of anyone who has been killed in an EMS crash?

Tragedy you don’t want to be involved in

Thursday July 5th 2007...... Paramedic Allan Parson’s killed

“...I’d like to know what can be done so this never happens again...."
2 weeks later... Friday July 20th 2007
The worst ambulance crash in USA history

Five Killed in Crash of Ambulance and Semi

July 21, 2007 08:20 AM EDT

VAN NEST, OHIO (AP) — The Ohio State Highway Patrol continues to investigate the crash of an ambulance that killed five people Friday night, including three emergency medical technicians. Troopers say the ambulance was broad-sided by a tractor-trailer on Crumline Road, about 35 miles southwest of Toledo.

The Highway Patrol says three EMS workers were killed. They were identified as 24-year-old Jonn Smith, 25-year-old Henry Mcquigg, and 25-year-old Kelly Bagley. The two patients were also killed. They were identified as 61-year-old Robert Wells and 50-year-old Amanda Wells of Hicksville.

Another emergency medical technician, Matt Mcquigg, and the truck driver, Gerald Chaplin Jr., of Indiana, were both taken to the hospital. It's not yet clear whether they suffered any injuries.

Authorities have not said who had the right of way at the intersection nor have they said if the ambulance's emergency lights were turned on.


April 22, 2012

EMSSafety.org

Emergency Medical Services (EMS)
An important and unique transport system
- Public safety, public health and emergency service
- Is there to save lives

Firstly!

- An accident?
- or a predictable and preventable event

A tragic emergency health care intervention outcome

It does happen....
A devastating tragedy…
- An ETT down the wrong hole may kill your patient and be a terrible burden for the pts family and for the medic involved

Negative impact on system performance…
- BUT an EMS crash can kill all those involved AND wipe out a rural EMS system AND negatively impact a regions response capacity……

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

Real world answers to real world questions -
- What features will enhance safety of my new vehicle purchase?
- What color scheme do I want on my vehicle to make it safest?
- Do I need a helmet, and if so which one?
- What policies offer the safest system?
- How do I get my team to address safety issues?
- What data should I collect when something goes wrong, and how to analyze it?

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

In the USA there are more safety standards for moving cattle than for moving patients
Absence of standards and oversight

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

Creating a Safety Culture

What we need to consider, where is the ‘bang for buck’ in ambulance transport safety:

- Awareness
- Training
- Incentive

Key elements to transport safety policies

- Vehicle/Fleet Safety
- Occupant protection
- Driver performance monitoring and feedback
- Hours of service
- Driver/provider wellness and fitness
- Driver/provider impairment
- Public safety

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
The Emergency Department (ED)

An ambulance is not an ED/ICU on wheels

Ground Ambulance Transport Safety IS Complex AND Multidisciplinary

- Epidemiological Data Collection
- Risk Management
- Public Safety
- Transport Policy
- PPE
- Driver Training
- Fleet Safety Program
- Ergonomic Research
- Biomechanical Automotive Safety
- Biohazard/Chem Research
- Communications technology
- Safety Technology
- Regulations and Standards

Do we ask vehicle builders to write cardiac arrest protocols...? Vehicle design and safety is not what we are trained to do!!!!

Would we....?

Seeing that we are health care providers – let's look at it this way –

- Would we use medical equipment that was built by folks who were not technically qualified or trained biomedical engineers and who just said “this device is safe”?
- Or would we expect them to be qualified in this field and that their products were tested in a meaningful way to ensure that they were safe?
In the vehicle
At the scene
During transport

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

And..
Balance of concerns and risk during transport

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

Some odd USA 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

Ambulance transport a serious transport safety problem...

- the most lethal vehicle on the road both per mile travelled and per vehicle
- is exempt from federal commercial fleet safety oversight (FMCSA)
- 2/3 fatalities not in the ambulance
- Exempt from most FMVSS standards

Data...

- What is your transport safety record in your service?
- How can you improve if you don’t have a meaningful measure of safety performance?
- Transport safety is not guesswork, it is a science

ESC – Does your ambulance have it??

- ESC helps drivers stay in control when they need to swerve or brake suddenly to avoid an obstacle or turn corners on slippery roads.
- Vehicles equipped with ESC are involved in fewer severe collisions caused by loss of control, resulting in significantly fewer deaths and injuries

1980’s Then....

Still current!....
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**
- > 74% of EMT occupational fatalities are MVC related***
- Serious head injury in >65% of fatal occupant injuries#
- More likely to crash at an intersection with traffic lights (37% vs 18% p=0.001) & more people & injuries/crash than similar sized vehicles##

*Kahn CA, Pirrello RD, Kuhn EM. Prehosp Emerg Care 2001 Jul-Sep;5(3):261-9
**Becker, Zaloshnja, Levick, Li, Miller. Acc Anal Prev 2003
#NIOSH, 2003
##Ray AM, Kupas DF. Prehosp Emerg Care 2005 Dec; 9:412-415

EMS Transport General Concerns

- Consequences can be predictable & likely preventable
- Costs of these adverse events are high in loss of life, financial burden and negative impact on delivery of EMS care
- Other high speed vehicles (eg. racing cars) have a different safety paradigm
- Design of interventions to mitigate injury is predicated on a valid testing model
- Complex both engineering and public health issues

USA EMS

- EMS Systems - >15,000
- Personnel - ~1 million (~30% F/T professional & 70% volunteer)
- Vehicles - ~80,000 (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 EMS transport safety data estimates

- ~ 80,000 vehicles
- ~ 9,000 crashes a year
- ~ One fatality each week
  - ~ 2/3 pedestrians or occupants of other car
- ~10 serious injuries each day
- Cost estimates > $500 million annually

Is it your service's tragic year?

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

Moose crash data....? – not EMS crash data

Occupational transportation fatalities..

- WE HAVE A BIG PROBLEM HERE

and what is killing EMS?

EMS personnel fatalities*

- 74% transportation related
  - 1/5 of ground transport fatalities were struck by moving vehicles
- 11% were cardiovascular
- 9% were homicide
- 4% needle sticks, electrocution, drowning and other

So does it make sense?

- Gloves and universal precautions?...
  ... good biohazard protection BUT aren't going to give much protection in an ambulance crash

This is in a setting where
- transport safety is the major and most costly adverse event in EMS
- and there have been all sorts of major technical and informational developments since Jan 2006

...is that there is a major problem with the present approach and what is being done currently
- and many practices are in conflict with, or not supported by, existing technical engineering science

Vehicles — smarter, sleeker, safer — CHEAPER!
Operations — new technology tools
Interdisciplinary infrastructure — new global platforms

Getting you, your patient and equipment in and out of the vehicle
Providing patient care inside the vehicle
Occupant protection in crash and near miss situations

What are your policies???
- If your patient is pink, warm and talking?
- Are you required to notify the driver if you are out of your seat belt?
- Are ‘routine procedures’ putting you at risk?
What is a safe speed and how do we identify that?

What is a survivable impact?

12 mph (20 km/hr)?

What is a survivable impact?

E = \frac{1}{2}mv^2

v^2 = 2as

~ 30 mph - survivable

~ 60 mph – not survivable

A survivable impact??

A serious problem…
Transport related aspects -
- dispatch of EMS/Medical transport vehicles
- transport policies and protocols
- vehicle fleets and vehicle design
- vehicle purchase standards
- Intelligent Transportation Systems (ITS) technology
- driver training
- driver performance monitoring
- roadside and road design
- integrated traffic safety technologies
- scene safety and visibility
- safety data capture
- safety oversight

Transport Medicine

A “Fleet” to many in Emergency Medical care means….
- Impact Biomechanics
- Transport Ergonomics
- Fleet Safety

Impact biomechanics
- Crashworthiness
- Vehicle design
- Occupant protection

Transport Ergonomics
- Operational tasks
- Human factors analysis
- Range of reach
- Patient loading and unloading
Fleet safety
- Operational policies – dispatch, safety
- Fleet mix
- Vehicle selection – safety, ESC, loading height
- Driver performance and monitoring
- Scene safety
- Visibility and conspicuity
- Safety measurement and management

June 17th 2008
a paramedic and a patient killed

EMS CRASH KILLS PATIENT AND A SUSSEX COUNTY (DE) PARAMEDIC IN THE LINE OF DUTY
Tuesday, June 17, 2008

We regret to advise you that a female Sussex County (DE) Paramedic was killed in the Line of Duty as was a patient killed in a horrific crash involving an ambulance in Sussex County (DE) this morning. The single vehicle crash happened around 02:40 Hours on the John J. Williams Highway near the Lewes-Rohoboth joint fire company station in Angola. The Mid-Sussex Rescue Squad ambulance was transporting to Beebe Medical Center with a patient, 2 MSRS Squad members and the Sussex County Paramedic were on board when it struck a tree, which opened the sides of the ambulance as seen on our home page. Tragically, the patient was killed as was the Sussex County EMS Paramedic, who was killed in the Line of Duty. Sussex County EMS also suffered a close call last year when a Paramedic John Schmitt was severely injured in a crash when a civilian struck the Milford Fire Company ambulance he was riding in, while returning from a run. Additional details on these meetings crash will follow.

In this vehicle...

October 31, 2008 - Kentucky

April 30, 2009 - Tennessee
Have you ever driven impaired/distracted?

The impaired driver

- Impairment
  - Illness
  - Exhaustion
  - Substance
  - Emotion
  - Distraction
    - CELL PHONE !!!!! – (A MAJOR HAZARD)
    - Other technology

Talking increases crash risk 5x
Texting is COMPLETELY UNACCEPTABLE

April 14th, 2008

Ambulance worker loses arm in accident - West Nyack, New York

Talking increases crash risk 5x

What policies and procedures do you have in place to protect your providers, service, patients and public???
This IS a Transportation and Automotive Safety issue

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

Safety is a tool to save

- Lives
- Time
- Money

must be evidenced based

Golden Hour – not so hot

- March 2010
- Annals EM

Golden Hour Summary

- This study suggests that in our current out-of-hospital and emergency care system time may be less crucial than once thought. Routine lights-and-sirens transport for trauma patients, with its inherent risks, may not be warranted. [Ann Emerg Med. 2010;55:247-248.]
April 2010, Resuscitation – Going fast can hurt your patient clinically!

CPR?

The laws of physics prevail...

- and they don’t care what your job title is or if you are a patient, a provider or a member of the public

Science behind Policy

- “For successful technology, reality must take precedence over public relations, for Nature cannot be fooled.”

Richard P. Feynman 1988

Important...

- Ergonomics and automotive safety issues are interrelated
- Crashworthiness priorities override the ergonomic issues

Goals

- Standards for safety
- Policy based on Science
- Databases to demonstrate outcome
Policies? – is pull over to the right really safer…?

MedStar Ambulances Will No Longer "Run Hot" When Transporting Cardiac Arrest Patients (4/21/2010)

"MedStar ambulances will no longer 'run hot' - when paramedics inside are giving chest compressions to patients in cardiac arrest, officials say." This "policy, which took effect Friday, will affect about 1,400 of the more than 100,000 calls to which MedStar responds annually in the 15 Tarrant County cities it serves."

NAEMT July 2006 Position statement

Policy makes a difference…
Patients must be in the over the shoulder harness, medics restrained in seat belts, equipment secured

Safety is Good Business

Are you self insured???

<table>
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<th>Year</th>
<th>Payroll $million</th>
<th>Modified Premium $10,000</th>
<th>Incurred Indemnity $1,000</th>
<th>Incurred Medical $1,000</th>
<th>Total Claims #</th>
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<td>9.6</td>
<td>411</td>
<td>13</td>
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</table>

Workers Compensation Rate increased by 27%

A problem

2011 Insurance data –
- 35 fold more likely to have a claim based on transport than related to medical care

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

2003 Insurance data –
- 10 fold more likely to have a claim based on transport than related to medical care

Expensive....

The Huntsville Times

Ambulance suit gets $3.1 million

Merriman’s baby killed in wreck with speeding vehicle

Tuesday, May 01, 2007
By DAVID HOLIBER
News Staff Writer david.holiber@ times.com

A federal jury awarded $3.1 million in damage to the family of a Madison County woman who died a May 1, 2007 in a collision with a speeding ambulance from Florida.

A family member of the woman is still pending in Madison County Circuit Court against the ambulance driver, Charles Christopher Bates of Tennessee.

Dianna Christine Bowden, 18, of Merrimanville 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. 231441 and West Limestone Road, about seven miles north of Huntsville.
Very Expensive

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

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

- Perception + Reaction time
- Vehicle Braking time (dry)
- Stopped at 176 feet

- Perception + Reaction time
- Vehicle Braking time (wet)
- Stopped at 220 feet

* Stopping distance:

- Perception time + Reaction time + Vehicle braking time

(varies with age, skill, agility, alertness + vehicle type, tire pressure, road etc)
Testing the real world

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

A few key words about restraint systems...

During impact

CTD dynamics

Impact residue

Deceleration Sled test (upon impact) 24 G, 30mph


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

What do we know now??

- Intersection crashes are the most lethal
- There are documented hazards, some which can be avoided
- Occupant restraint with standard belts is effective. (Over the shoulder belts for patients, with the gurney in the upright position where medically feasible)
- All equipment should be locked down
- Some vehicle design features are beneficial - automotive grade padding in head strike areas, seats that can slide toward the patient
- Head protection??
- Electronic Driver monitoring/feedback systems appear to be highly effective

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 over both shoulders for sidefacing occupants are potentially lethal – and in NO WAY SUPPORTED BY ANY DATA OR INDEPENDENT AUTOMOTIVE SAFETY EXPERTISE

Systems safety failure AND dangerous

Overwhelming existing evidence these practices are HIGHLY dangerous
NO evidence whatsoever that these practices are NOT dangerous, let alone safe

NOT new technical data…
Air EMS is a role model for safety initiatives and focus

Air Safety Approach

- Safety Program Planning
- Evaluating
- Analysis of Safety Performance
- Analysis of Safety Information and Data
- Analysis of Risk Profiles and Plans

An Aviation Safety Plan

Ambulance Safety Research: A New Field
We should use the best safety practices demonstrated in engineering...

...in automotive safety engineering

and in ergonomics

August 11, 2011
Online Annals:

Your back… – 1880’s

Ouch…!!!
My back

2011… but these can really hurt your back too!
EMS Ergonomist Chris Fitzgerald addressing the EMS Safety Foundation Workshop

The science of Stretcher lifting & loading

So what's important..

- A stretcher system that doesn't harm your back... and your services wallet
- The new Mondial Ferno
- A 27 inch loading height

And what is the loading height of your ambulance??

Size matters.... Less than 27 inches will save your back!!!!

2012....
Range of reach.. This is a well defined technical science

‘Workplace’ Hazards

Bigger is not necessarily better……
But what about head protection?

New EMS helmet prototypes

Which of these two vehicles would you want?
Sprinter v Ford Transit crash test
http://www.youtube.com/watch?v=C3kN6WF5vAA&feature=related

High speed crash, rolled and the occupants (patient and medics) had only minor scratches
‘Safety’ approaches being driven by manufacturers claims and sales rather than by science and data

Yes, the ride of your life….

- Sure… these vehicles all parade around the EMS and Fire shows BUT…
- NOT ONE of these vehicles has been to the automotive safety shows or scrutinized by the automotive safety industry

October 2008 JEMS Article
“Rig Safety – 911”

Ambulance Vehicle Standards??
- KKK?
- AMD?
- FMVSS?
- CMVSS?
- NFPA?
- SAE…?
- ASTM…?
- International
  - ASA
  - CEN

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
SAE Ambulance Equipment mounting testing standards
Frontal Impact SAE 2917, published May 2010
Side Impact SAE 2956, published June 2011

Best Practices?

EMS Best Practice, Sept 2006

It isn’t like this in the rest of the world

Worker visibility Act: November 24th 2008
Day visibility

Night visibility

Here’s the real world at 6 ft...

August 2009 – Visibility review

Policy and practice ignorant of existing technical safety data

Figure 1. The scotopic (dashed line) and photopic (solid line) luminous efficiency functions, describing the spectral sensitivities of night and day vision, respectively.
This addresses some very real risks, very creatively – and currently ONLY available in London Ontario!

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

Color-blindness affects 10% of the population

- As seen with normal vision
- As seen with color blind vision

Emergency Vehicles – Viewer Awareness

For a timely, appropriate and safe response

- Location
- Size
- Shape
- Speed
  - Intended path

- Having access to that technical knowledge supports changes to improve safety practice
Summit County EMS - Colorado

Old vehicle

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

Muskoka EMS - Canada

Old design

New design

Muskoka EMS - Canada

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

Innovation

Safety concepts out there now

- Driver feedback technologies
- Tiered dispatch
- Enhanced ambulance vehicle design
- Intelligent Transport Technologies – ITS
- New platforms for interdisciplinary exchange
- New Safety Standards
Transport performance

- Driver training?
- Real time safety performance outcomes?

Invehicle technologies to enhance transport safety

- Aftermarket in vehicle electronic e-safety devices with monitoring and feedback

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

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

Nadine R. Levick, MD, MPH
Massachusetts Medical Center

Invehicle technologies to enhance transport safety

- Aftermarket in vehicle electronic e-safety devices with monitoring and feedback

Human Interface approaches

- Hardware fitted to the vehicle
- Non hardware App Driven cellular technology

The “Feedback box”

Driver behavior monitoring and feedback device

How to modify the risk-taking behaviour of emergency medical services drivers?

Road Safety

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
Demonstrated Effectiveness

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

And when a rare crash happens....

Unit 302 Accident

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 in-service or retraining after the initial introduction period.

THE ACETECH™ AVI advantage

ACETECH™ AVI – Vehicle Informatics
- Know where your vehicles are
- Dispatch the closest, most appropriate unit
- Improved productivity
- Reduce fuel expense
- Reduce carbon emissions
- Reduce response times
- Reduce risk (shorter response)
- Fewer collisions
- Reduced injuries
- Plus: Panic / emergency button to alert to operations
ACETECH AVI

- Fleet Summary
- Journey Report
- Fleet Battery
- Fleet Utilisation
- Speeding Report
- Fleet Incident Report
- Fleet Response Times
- Emergency incident Report
- Engine Idle Report
- Fuel Usage and Cost
- Event Notification
- Shore Line Charge Usage
- Cost on Grid

Telematicus

- “Learn”
  - All Trips recorded (start trip/stop trip)
  - Established the benchmarks
  - Alarm Active
- “Guide”
  - Speed feedback activated
  - Driver Clinics
  - Automated Application update
- “Sustain”
  - Messaging
  - Incident Management
  - ISA

GGD views

A smart phone App that is a safety tool

- GPS and GPRS status
- Driver and vehicle ids

Example trip trace from the ggdrive business application. This trace is automatically created using GPS data send from gg drive and can be used to analyse speed, distance, acceleration (deceleration), and time during the trip.

Example scorecard of comparative driver performance from the ggdrive business application. The scorecard is created using telematics data from dedicated on-board telematics device and is presented in traffic light format against benchmark and set targets.

GGD Smartphone views

Driver’s individual performance against company set performance targets in the system

- Needle points to individual driver performance against targets
- Green area represents the difference between standard and stretch targets
- Goals can be varied by region, market, team as required
- Performance is updated and presented in real time.

Harsh Braking per 100 trips
Realtime mapping from London for 2.5hr of a trip of attempting to park in NYC after a snow storm and whilst ‘Law and Order’ filming was underway

What could you learn from the National Academies – right NOW and gratis

- The realm of burden and benefit
  - measuring the safety of the system
  - determining the economic, ethical and risk benefit challenges
- Transport System Management
  - fleet safety and oversight technologies and policies
  - operations management – dispatch, congestion routing, deployment of resources, benchmarking
- Vehicle safety
  - occupant protection design and testing
  - Vehicle performance safety
  - vehicle and personnel human factors issues
- Dissemination and Policy
  - Knowledge transfer
  - Standards, specifications and policy

Its out there NOW

- TRB 2009 Summit – addressed the key and interdisciplinary issues, in one day – please seek that information out.
- There have been two TRB Summits held, 2008, 2009 and both with vehicle engineering and transportation systems technical expertise

Independent Technical Expertise

- The “kitchen design” is completely unacceptable and a failure in health care delivery, occupant protection and ergonomics.
- Independent technical expertise must be here and involved

NEXT

EMS Safety Systems, Strategies and Solutions Summit – February 29th 2012 – sign up now
2012 TRB Summit

- Safety Systems Strategies and Solutions Summit
- To be held on site DC and online Feb 29
- Auspices of the National Academies of Science, Medicine and Engineering

EMS Safety Foundation

- Established in 2008 to fill a gap in
  - technical knowledge transfer
  - practical interdisciplinary R & D
  - evaluation and implementation of system safety enhancements for EMS and Medical Transport
- It is a not-for-profit institute

Mission

- This is a team of like minded innovators across EMS Medical Transport and a number of technical disciplines, who share the common mission of enhancing the safety of EMS delivery for all involved.

The EMS Safety Foundation: A practical and functional model

Interdisciplinary and Operational and International
- Innovation
- Collaboration
- Knowledge transfer

R & D “Ripoff and Duplicate”

- Avoid reinventing the wheel at all costs
- Where are the best practices that we need to transfer knowledge from
EMS Safety Foundation Delegation seeking out International Innovation

The state of the art non-USA vehicles have NO squad bench nor the aftermarket structural vehicle modifications that can potentially decrease crashworthiness integrity that were seen in study vehicles.
Rettmobil 2011 – May 11-13th

RETTmobil is -

- A major European Emergency Rescue Congress, Trade show and Symposium
- Held in Fulda, Germany
- Established in 2001
- Attended by ~ 20,000 attendees
- Brainchild of Prof Peter Sefrin

EMS Responder Rettmobil 2010 Delegation
http://www.emsresponder.com/web/online/Safety/Live-From-RETTmobil/2913137
Vehicle Occupant Safety design

European design
Safety technology is a key focus
Safe and Ergonomic design

Patient Transferring Slides
Ergonomic layout and equipment

Flexibility to manage two patients

PodCasts - with Kyle Bates in ‘First Few Moments’

- Latest Podcast - Chris Fitzgerald, our EMS Safety Foundation’s Director of Human Factors and Ergonomics shares some key points on lifting and moving patients and equipment - [http://firstfewmoments.com/?p=742](http://firstfewmoments.com/?p=742)

- Guest Technical Expert
  – Jonas Liden, Industrial Design, Sweden
the result of the frequency analysis, green dots mark equipment used every time the ambulance is driven, orange

Texas - Careflite's new vehicle
Careflite’s new vehicle

The new Oslo Ambulance
Tips for Emergency Vehicle Operations

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

Technical Collaboration is key
- We are NOT the experts in this science
- We cannot afford to play the silo game here, it is costing lives, time and money
- We MUST have a meaningful evidenced based approach to design, operations and policy
- We must be outcomes driven

USFA Emergency Vehicle Safety Initiative

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

this vehicle is safety crash tested by automotive experts
Unlike this vehicle

Which vehicle do you want to be in?
Which vehicle is the best for efficient, and effective patient care?
Which vehicle provides optimal risk management?
What is the optimal fleet mix?

Fleet Mix?

Were we safer in the Cadillac???

Vehicle Operations Safety Policies
Squad bench lap seat belts
Patient over the shoulder belts
Securing equipment
Forward and rear facing seating
Some electronic technical devices
Safety awareness
Cultural change
Risk/Hazards

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

Goals

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

Safety Management

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

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

Future directions

- Meaningful Goals
- New policies
- New practices
- New standards
- New vehicles
- New technologies

Key future focus

- Data and Recent Initiatives
- Transport Technical science
- Human Factors
- Bridging Diverse Disciplines
- Testing and Standards
- New systems safety technology solutions
- Fleet management strategies
- Innovative Vehicle Design
- Operationalizing Safety
Conclusion

- EMS transport has serious hazards and safety issues
- Major advances in EMS safety research, infrastructure and practice over the past 5 years
- Development of substantive EMS safety standards is a necessity and a reality
- Multidisciplinary safety issue that EMS cannot solve internally
- Failure to transfer knowledge from transportation and automotive safety is unacceptable and dangerous
- EMS is still way behind the state of the art in vehicle, transportation and occupational safety

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 and the public from injury and death

Thank you!
Any Questions??
Electronic handout and resources available online http://www.objectivesafety.net