EMMCO West, Inc.
Northwestern PA EMS Council

EMS Safety Conference
November 9&10, 2012
Ambassador Conference Center in Erie, PA

Ambulance Crashes – Research & Are You Safe in An Ambulance?

Bang for buck: Ambulance Safety, Standards and Survival - What do you need to know!

Nadine Levick, MD MPH
Research Director, EMS Safety Foundation
CEO, Objective Safety, New York, USA
Chair, TRB, EMS Subcommittee, National Academies

EMSSafety FOUNDATION
www.EMSSafetyFoundation.org

October 28, 2012

EMSSafety FOUNDATION
www.EMSSafetyFoundation.org

What are we going to cover today?

- Key principles of ambulance transport safety
- Ambulance safety research and data
- National and Regional Standards and Guidelines
- How to make your ambulance transport environment safer right now
- Future goals for Ambulance transport safety

EMSSafety FOUNDATION
www.EMSSafetyFoundation.org

Goals and Learning Objectives

- Educate on the risks to patients, transport and emergency medical service providers and the public from ambulance transport adverse events
- Identify and explore factors related to ambulance crashes and identify potential mechanisms of injury to EMS transport providers, patients and the public and expose safety myths
- Instruct providers on strategies for enhancing transport safety and reducing risk of injury to patients and providers and the public during transport

EMSSafety FOUNDATION
www.EMSSafetyFoundation.org

pennsylvania
Emergency Medical Services

EMMCO West, Inc.
Northwestern PA EMS Council

MILLCREEK PARAMEDIC SERVICE
COMMUNITY AMBULANCE SERVICE, INC.
VEMSACC

EMSSafety FOUNDATION
www.EMSSafetyFoundation.org

Emergency Medical Services (EMS)
An important and unique transport system

- Public safety, public health and emergency service
- Is there to save lives

EMSSafety FOUNDATION
www.EMSSafetyFoundation.org

Emergency Medical Service

- 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 and share with our international colleagues

EMSSafety FOUNDATION
www.EMSSafetyFoundation.org

Your electronic Handout awaits you online at…

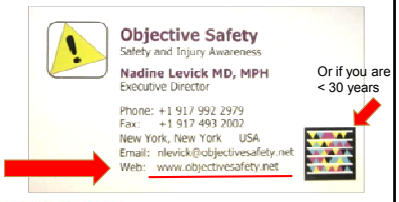
- www.objectivesafety.net

This WILL be FAST!!

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

EMSSafety FOUNDATION
www.EMSSafetyFoundation.org

Your electronic handout/resource card



EMSSafety FOUNDATION
www.EMSSafetyFoundation.org

http://www.objectivesafety.net

Your Handout and Additional Resources

EMSSafety FOUNDATION

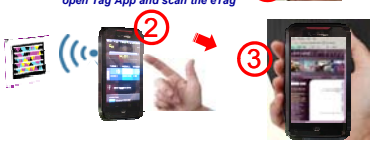
www.EMSSafetyFoundation.org

How do you use an eTag for the first time?

Get Microsoft Tag App on your smartphone
(free from your App store, it reads ALL eTags)

1

open Tag App and scan the eTag



2

3

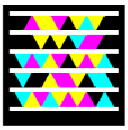
www.objectivesafety.net/PDFHO.htm

form will open directly on your phone

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

Your handouts etag page



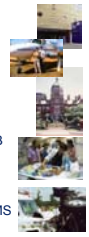
for those not of the Y or @ generation!
- if you have a smart phone
- and you have downloaded free Tag Reader
- point your phone and capture this etag to get today's handout on your phone

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

Who am I?

- Nadine Levick MD, MPH
- Emergency Medicine Physician and Public Health Academic, (USA-Hopkins, Columbia SUNY & 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



EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

ASSOCIATED PRESS

Jump start

A RoboRoo Series II kangaroo tests dummy is used in New South Wales, Australia, to help automobile designers study a unique Australian road safety issue — traffic accidents with kangaroos.

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

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

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

Emergency Medical Services (EMS) An important and unique transport system

- Public safety, public health and emergency service
- Is there to save lives

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

The Public Health Paradigm

1. Define the problem
2. Measure its magnitude
3. Understand the key determinants:
   a. Biologic etiology: host /agent/vector
   b. Environmental & biomechanic influences
   c. Social/behavioral practices of at risk pop.
4. Develop intervention/prevention strategies
5. Set policy/priorities
6. Implement and evaluate

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

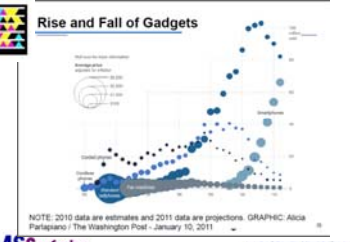
White House Safety Data Palooza September 14, 2012

EMSSafety FOUNDATION

Interdisciplinary Innovation Consortium

EMSSafety FOUNDATION
Innovation, Collaboration & Knowledge Transfer
www.EMSSafetyFoundation.org

Communication Technology trends

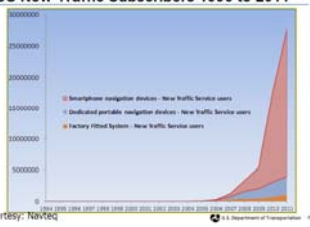


January 2012, USA

Smartphone penetration by age and income

Smartphone navigation devices

US New Traffic Subscribers 1996 to 2011



Courtesy: Navteq

A lot is now possible and for less!

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

Goals

- Cheaper
- Better
- Safer

EMS Transport Safety

- 'patient safety'
  AND also
- 'provider' and 'public safety'

Things can go wrong –

but when there are sound safety policies and technologies in place, and the system is well prepared, you can minimize harm

September 27, 2012

- The ambulance was NOT using lights and siren
- There was a passenger in the front from the initial car accident and three EMTs in the patient compartment.
- The driver of the ambulance stated to the crew that he was becoming lightheaded and dizzy and began to pull off the road, passed out and depressed the accelerator.

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

- Two of the EMTs were not wearing a seatbelt.
- The third EMT was on the squad bench and was wearing a seat belt.
- The third EMT was uninjured aside from some bruises, and was back at work the next day.
- The other two have significant though non-life threatening injuries, but have prolonged injuries.

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

Seat Belt and Restraint Use:

Seat belts or restraints will be securely fastened to the following individuals when the vehicle is in motion:

- 1) All EMS vehicle operators
- 2) All patients
- 3) All non-EMS passengers (cab and patient compartment)
- 4) All EMS practitioners (when patient care allows)
- 5) All infants and toddlers (these children should be transported in an age appropriate child seat if their condition allows). Children should not be placed in cab passenger seat with airbag.

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

September 4, 2012- Las Vegas

EMSSafety FOUNDATION

August 27, 2012 - NYC

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

Paramedic David Restuccio killed

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

Friday September 7, 2012

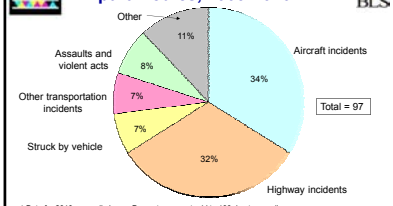
NYC Funeral of Paramedic David Restuccio

EMSSafety FOUNDATION

EMSSafety FOUNDATION

Fatal injuries among EMTs and paramedics, 2003-2010*

BLS



* Data for 2010 are preliminary. Percents may not add to 100 due to rounding.
Source: Bureau of Labor Statistics, Census of Fatal Occupational Injuries

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

Science behind Policy

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

  Richard P. Feynman 1988

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

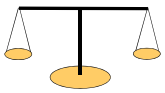
Communicating risk

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Which image of October 26th communicates better risk perception?

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Balance of concerns and risk during transport



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

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Safety of the…

- Provider
- Public
- Patient

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

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

TIME & PLACE

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

The Emergency Department (ED)

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

An ambulance is <u>not</u> an ED /ICU on wheels

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Firstly!

- An accident ?
- or
  a predictable and preventable event

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

A tragic emergency health care intervention outcome


Ambulance crashes: Patients wife killed

Rollover Crash Kills Medical Technician

It does happen….

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

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

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

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……

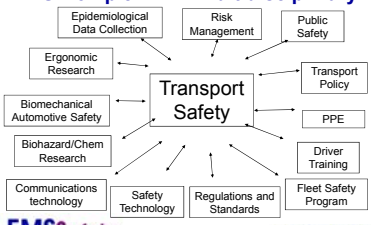
EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Ambulance Transport Safety

- Emergency care, public heath, 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

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Ground Ambulance Transport Safety IS Complex AND Multidisciplinary



EMSSafety FOUNDATION www.EMSSafetyFoundation.org

So

- What's important
- What's not important

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

- What's going to save your life
- What might take your life

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

- What's going to hurt you
- What's going to protect you

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

- What is factual
- What is garbage

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

- What is new
- What is not new

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

Letter to Abe Lincoln – 1864 re: safety of ambulance design

EMSSafety FOUNDATION

1864 Ambulance Design Patent and diagrams

Almost 150 years ago

UNITED STATES PATENT OFFICE.

IMPROVEMENT IN AMBULANCES.

EMSSafety FOUNDATION

1880's

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

USA EMS in 1917

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

USA 1980's Then….

And NOW!…

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

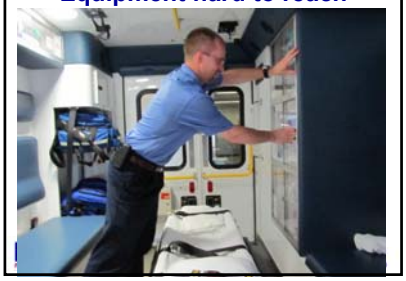
USA 1980's Then….

And 2012…

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

Equipment hard to reach



Innovation Now…

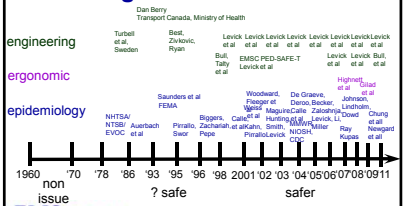
Real world answers to real world questions -

- 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?

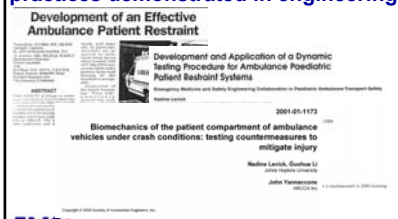
- What we need to consider, where is the 'bang for buck' in ambulance transport safety
- Where is the low hanging fruit?

WE DO HAVE TECHNICAL DATA!!!

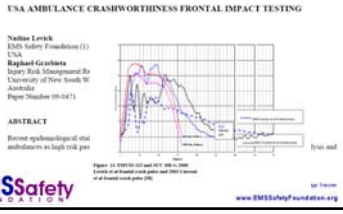
Ambulance Safety Research: No longer such a New Field



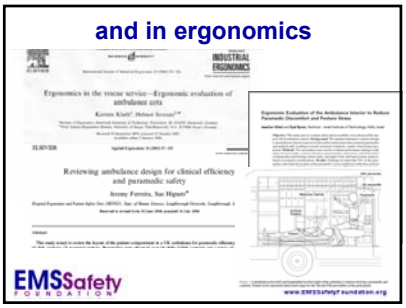
We should use the best safety practices demonstrated in engineering



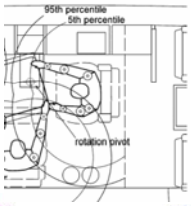
ESV July 2009



and in ergonomics



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



As well as epidemiological injury data August, 2011

http://www.ncbi.nlm.nih.gov/pubmed/21834620


FATAL AND NONFATAL INJURIES AMONG EMERGENCY MEDICAL TECHNICIANS AND PARAMEDICS

Audrey A. Reichard, MPH, OTR, Suzanne M. Marsh, MPA, Paul H. Moore, BSME

EMSSafety FOUNDATION

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

Who writes vehicle and occupant safety standards??

- FMVSS
- SAE
- CEN
- ASA
- ISO
- KKK – only ambulances
- AMD – only ambulances
- ASTM – only ambulances
- NFPA – for fire trucks and now ambulances
- Health Care providers – MARYN report

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

TRB TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES

2012 EMS Safety Systems, Strategies and Solutions 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!!

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

The 2012 TRB EMS Safety Summit

print this page & your smart phone will play the 8 sessions from the eTags! (even in B&W)

- 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

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org


TRANSPORTATION RESEARCH BOARD

2012 EMS Safety Systems, Strategies and Solutions Summit

THE NATIONAL ACADEMIES

http://www.emssafetyfoundation.org/2012TRBSummitAgendawithLinks.pdf

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

The impaired/distracted driver

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

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

Talking increases crash risk 5x Texting is COMPLETELY UNACCEPTABLE 23X increase in crash risk

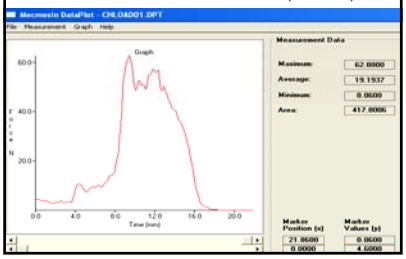
EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

The science of Stretcher lifting & loading

EMSSafety FOUNDATION

Stretcher Load - # 1 (CNLOAD01)



And what is the loading height of your ambulance??

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

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

EMS SAFETY COURSE

National Association of Emergency Medical Technicians

NAEMT

www.EMSSafetyFoundation.org

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

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

A lot is now possible and for less!

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

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

Fleet Management technologies

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

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

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

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

Telematics

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

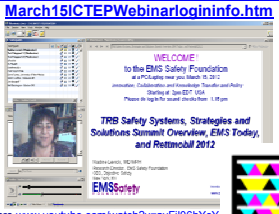
Its out there NOW

- 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

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

March 2012 EMSSF TRB Synopsis Webinar

http://www.emssafetyfoundation.org/Recorded2012March15ICTEPWebinarlogininfo.htm



Click here www.youtube.com/watch?v=avFjl06bYcY or scan this eTag to see it on You Tube

EMSSafety FOUNDATION

USA Ambulance Standards & Testing

- KKK A 1822F: Purchasing Guideline
  - "Minimum Specification and performance parameters"
- AMD-001-025: Manufacturing Guideline
- ASTM F2020-02a: Standard Practice
- **NFPA 1917 Standard for Automotive Ambulances: 2013 Edition**

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Ambulance Standards and Testing

- Interrelated – mostly paraphrasing each other's requirements
- Self certified

NFPA 1917 Standard for Automotive Ambulances: 2013 Edition

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

International Ambulance Design Safety and Occupant Protection Standards

In existence since 1999

- Australia – ASA
- Europe - CEN

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

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

to retire October 2013

- Specifications for purchase of Star of Life Ambulance
- Static Pull test
- 2200 Lbs. static stretcher test in longitudinal, lateral & vertical
- No dynamic test for vehicle, occupants or equipment
- No automotive test manikin
- Voluntary

www.ntea.com/WorkArea/downloadasset.aspx?id=1352

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

USA Ambulance Manufacturing Division (AMD) Ambulance Standards – August 2007

(being integrated into NFPA 1917)

- No dynamic or impact test
- No automotive test manikin
- Mandates NO 'crumple zone'
- No impact tested anchorages for occupant or equipment
- Internal, not independent & not a standardizing body

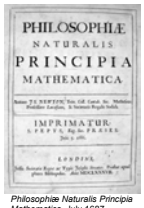
http://www.ntea.com/WorkArea/showcontent.aspx?id=1350

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

AMD ambulance '*safety testing*' ? – Is NOT consistent with accepted automotive safety practice…

Yes a "nationally recognized testing lab" – BUT - NOT an automotive/occupant safety crash test lab!!

The Laws of Physics Prevail..



Philosophiæ Naturalis Principia Mathematica, July 1687

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

No 'a'… then NO 'F' !!!!!

- F = ma

where F – force
m – mass
a – acceleration

Sir Isaac Newton (1642-1727), Philosophiae Naturalis Principia Mathematica (Mathematical Principles of Natural Philosophy), published in 1687. http://en.wikipedia.org/wiki/Newton's_laws_of_motion

AMD 2007 - 025 'static occupant safety testing'

- Compared with -

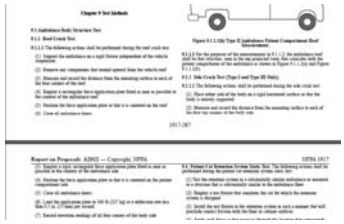
Accepted automotive safety dynamic occupant testing

EMSSafety FOUNDATION

NFPA 1917, August 2012

(based on KKK, AMD)

NFPA 1917 - Test Methods



EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

NFPA 1917 Testing Criteria

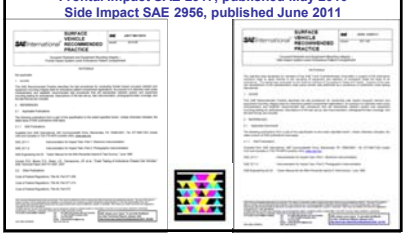
- AMD Standards incorporated
- Side load testing types I and III
- All adjustable seats must be dynamically tested to SAE J2917
- Seat belts for side facing seats tested to FMVSS 210

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

SAE Ambulance Equipment mounting testing standards

Frontal Impact SAE 2917, published May 2010
Side Impact SAE 2956, published June 2011



NFPA - Key issues identified by EMS Safety Foundation

- Key that meaningful safety data drive the process
- Need for ambulance safety, injury and fatality mechanism outcomes data be used
- Integration and collaboration with technical automotive occupant protection and crashworthiness expertise is paramount

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

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

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

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

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

Is there an acceptable rate of morbidity and mortality for pre-hospital transport systems??

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

USA EMS

- EMS Systems - >19,000
- Personnel - ~1 million
  (~30% F/T professional & 70% volunteer)
- Vehicles - ~80,000
  (Type I, Type II, Type III, Freightliners, ?motorcycles)
- Transports - ~30 million
  (to Emergency Depts ~ 50%, < 1/3 emergent)
- Cost - ~$8 Billion annually
- Safety Oversight - ? Disparate

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

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

*FARS/BTS 2007

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

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, Pirralo RG, Kuhn EM, Prehosp Emerg Care 2001 Jul-Sep;5(3):261-9
**Becker, Zaloshnja, Levick, Li, Miller, Acc Anal Prev 2003
***Maguire, Hunting, Smith, Levick, Annals Emerg Med Dec 2002
#NIOSH, 2003
##Ray AM, Kupas DF, Prehosp Emerg Care 2005 Dec; 9:412-415

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

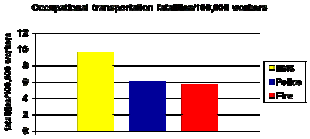
EMS Transport General Concerns

- 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

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

USA Occupational transportation fatalities..



- WE HAVE A BIG PROBLEM HERE

Maguire, Hunting, Smith & Levick, Occupational Fatalities in Emergency Medical Services: A Hidden Crisis, Annals of Emergency Medicine, Dec 2002

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

and what is killing EMS ?

USA 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

** Maguire, Hunting, Smith & Levick, Occupational Fatalities in Emergency Medical Services: A Hidden Crisis, Annals of Emergency Medicine, Dec 2002*

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

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

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

FMVSS exempt……

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

August 2009 – Impaired…

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

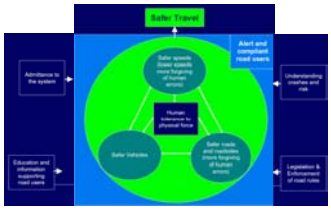
September 25, 2012

EMSSafety FOUNDATION

Training… effectiveness…??

EMSSafety FOUNDATION

Safe Systems Approach



Source: Road Safety Branch, Infrastructure and Surface Transport Policy, Department of Infrastructure, Transport, Regional Development and Local Government, Australia.

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Systems safety of:

- 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
- Public safety

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Occupant Systems Safety

- Occupant Safety in EMS is driven by both operational and biomechanical systems.
- Systems Safety integrating these two issues is key
- There is interaction of occupants with the system, with each other and with available seating options and vehicle interior, equipment and operational tasks.

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Safety Performance

- Measurement
- Outcomes
- Technical expertise

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Some new dimensions

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

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Safety of the…

- Provider
- Public
- Patient

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Safety is a tool to save

- Lives
- Time
- Money

must be evidenced based

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

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

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

When is it safe to do what… ?

- 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?

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

What is a safe speed and how do we identify that?

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

What is a survivable impact ?

IRMRC

12 mph (20 km/hr)?

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

What is a survivable impact?

$E = \frac{1}{2} mv^2$ $v^2 = 2as$

~ 30 mph - survivable

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

What is a survivable impact?

$E = \frac{1}{2} mv^2$ $v^2 = 2as$

~ 60 mph – not survivable

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

A survivable impact??

A serious problem…

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

A few key words about restraint systems…

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Dynamic Sled Testing of Ambulance Pediatric Restraints

(a resident research project)

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Deceleration Sled test

(upon impact) 24 G, 30mph

Levick NR, et al. Development and Application of a Dynamic Testing Procedure for Ambulance Pediatric Restraint Systems, SAE Australasia 1998;58:2:45-51

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Testing the real world

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

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

CTD dynamics

EMSSafety FOUNDATION

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

EMSSafety FOUNDATION

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…

Richardson S.A., et al, Int. J. of Crash., 4:3, 239 – 259, 1999

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

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

Beware some provider restraint systems are dangerous

Richardson S.A., et al, Int. J. of Crash., 4:3, 239 – 259, 1999

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

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

'Workplace' Hazards

EMSSafety FOUNDATION

Bigger is not necessarily better……

EMSSafety FOUNDATION

High speed crash, rolled and the occupants (patient and medics) had only minor scratches

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org

Thank you!

Any Questions??

Electronic handout available online

http://www.objectivesafety.net

EMSSafety FOUNDATION

www.EMSSafetyFoundation.org