March 28, 2012, Inwood, NY

“Ride of your Life”
What you Can’t Afford Not to Know About Ambulance Safety

To quote Steve “Sid” Caesar – Director IHS ES

“We want everyone to get home safely each day”

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

Outline

I. Identification of ground EMS transport safety issues, hazards and areas of risk to patients, providers and public
II. Highlight unacceptable mythology and challenges to advancing EMS transport safety
III. Profile innovation, new safety technologies and strategies and knowledge transfer to enhance safety and reduce risks of ground EMS and patient transport

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

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
http://www.objectivesafety.net
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


Philadelphia crash

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?

FDNY NUTHOUSE TRUCK CRASHES - INJURES SEVERAL

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

January 13, 2011
Patient dies after ambulance, car collide

February 16, 2011
Ambulance crashes seconds away from hospital

March 28, 2011
2 EMTs injured in Mullica Twp. ambulance crash - New Jersey

April 18, 2011
One dead, six injured in ambulance crash - South Carolina
June 3, 2011

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

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

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

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

Creating a Safety Culture:
within a company must have leadership and support of upper management:
- 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.

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?

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

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.

Ontario EMS Occupant Safety
30 August 2010

And...
- In the vehicle
- At the scene
- During transport
### EMS Transport Safety

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

### 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....

- And Now!....

### 1980’s Then....

- And Now!....
So

- What’s important
- What’s not important

An interhospital transport?
“Do no harm….”?

- What is factual
- What is garbage
- What is new
- What is not new

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##

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

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

**Kahn CA, Prehosp Emerg Care 2011 Jul-Sep;15(3):261-9
****Ray AM, Kupas DF, Prehosp Emerg Care 2005 Dec; 9:412-415
##Ray AM, Kupas DF, Prehosp Emerg Care 2005 Dec; 9:412-415
USA EMS

- EMS Systems - >15,000
- Personnel - ~1 million
  (~30% F/T professional & 70% volunteer)
- Vehicles - ~50,000
  (Type I, Type II, Type III, Freightliners, ?motorcycles)
- Transports - ~50 million
  (to Emergency Depts ~ 50%, < 1/3 emergent)
- Cost - ~$8 Billion annually
- Safety Oversight - ? Disparate

USA EMS transport safety data estimates

- ~ 50,000 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

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

Gloves and universal precautions?...

... good biohazard protection BUT aren’t going to give much protection in an ambulance crash

So does it make sense?

And...

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

New Information/Technical Developments Jan 2006 - Jan 2011

- SAFEITEA-LU, 2006 – EMS identified as one of the 4 E’s
  (Safe, Affordable, Flexible, Efficient) by President’s Commission
- International Ergonomists Association (IEA) - publication June 2006
- Enhanced Safety of Vehicles (ESV) - publications June 2007, 2009
- National Academies TRB – Inaugural EMS Safety address, Jan 2007
- NEMSAC established – April 2007
- AMD Automotive Engineering Public Comments - July 2007
- OSHA September 11, 2007 EMS safety in Federal Register
- State Strategic Highway Safety Plans, October 2007
- Sporadic State EMS Council Transport Safety Policies
- EMS Safety Foundation established – Dec 2007
- National Academies TRB – Inaugural EMS Safety Subcommittee meeting Jan 2008
- National Academies TRB – 1st EMS Safety Publication Jan 2008
- Transportation Safety Advancement Group (TSAG) – Feb 2008
- Society for Automotive Engineers (SAE) – publications Oct 2007, 2008, 2009
- Worker visibility Act – Nov 2008
- SAE Ambulance Standards development – May 2010
- NFPA Ambulance Standards Committee – June 2009
- EMS Safety Foundation Innovation Workshop - October 2010

A challenge we know now...

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

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

Safety Performance
- Measurement
- Outcomes
- Technical expertise

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?

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

What is a survivable impact?

12 mph (20 km/hr)

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

~ 30 mph - survivable

~ 60 mph – not survivable
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

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

April 14th, 2008
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 she was a patient killed in a serious crash involving an ambulance in Sussex County (DE) this morning.

The single-vehicle crash happened around 0245 hours on the John J. Williams Highway near the Lewes-Bolton just off the company entrance in Lewes. The Mid-Sussex Rescue Squad ambulance was transporting to Sussex Medical Center. The Lewes-Bolton was a patient was a Serif Sussex County EMS Paramedic, who was killed in the Line of Duty.

Sussex County EMS also suffer a critical injury to a critical injury when a driver that struck the Middletown Fire Company ambulance in (

April 30, 2009 - Tennessee

EMS RESPONDER

EMS Safety Foundation

October 22, 2009, TN
Patient and Provider killed, Attendant Critical

EMS RESPONDER

EMS Safety Foundation

Monday November 30, 2009
Smithfield

EMS RESPONDER

EMS Safety Foundation

October 31, 2008 - Kentucky

EMS RESPONDER

EMS Safety Foundation

August 2009 – Impaired…

EMS RESPONDER

EMS Safety Foundation

December 2009

EMS RESPONDER

EMS Safety Foundation
This IS a Transportation and Automotive Safety issue

Safety is a tool to save

- Lives
- Time
- Money

must be evidenced based

Golden Hour – not so hot

- March 2010 Annals EM
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!

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...?

May 13, 2010...
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.

Policy makes a difference...

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

Are you self insured???

<table>
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<th>Year</th>
<th>Payroll $milllion</th>
<th>Modified Premium $1,000</th>
<th>Incurred Indemnity $1,000</th>
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<td>9.6</td>
<td>411</td>
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</tbody>
</table>

Workers Compensation Rate increased by 27 %

A problem

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....

Ambulance suit gets $3.1 million

And very Predictable...

- Intersections are lethal environments

Testing the real world

Very Expensive

$24 million judgement against AMR

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

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

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

A few key words about restraint systems...

**Dynamic Sled Testing of Ambulance Pediatric Restraints**

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

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

**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...**

Side facing 4-point harnesses demonstrated to be lethal, even at slow ground vehicle speeds
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 side-facing occupants are potentially lethal – and in NO WAY SUPPORTED BY ANY DATA OR INDEPENDENT AUTOMOTIVE SAFETY EXPERTISE

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

Air EMS is a role model for safety initiatives and focus

Intersection crashes are the most lethal
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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

Ambulance Safety Research: A New Field

We should use the best safety practices demonstrated in engineering

...in automotive safety engineering
Ambulance Safety Research: A New Field

- Funding??

Tort Claims from Adverse Events in Emergency Medical Services

- Henry E. Wang, Rollin J. Fairbanks, Manish N. Shah, Donald M. Yealy, University of Pittsburgh, Pittsburgh, Pennsylvania, Jan 2007

- Methods: 2003-2004 liability claim records that resulted in injury to patients or other individuals.
- 275 cases, with emergency response in 46% and nonemergency response in 39%.
- Ground ambulances (67%) and wheelchair vans (19%).
- Adverse event categories included:
  - patient handling (40%),
  - emergency vehicle movement or collision (31%),
  - medical management (17%),
  - EMS response or transport (8%),
  - lack or failure of equipment (7%), and other errors (9%).
- Patient handling errors included:
  - stretcher or wheelchair “tip” (28%),
  - patient drops (31%),
  - injury during patient movement (19%),
  - patient falls (17%).

- Conclusions: Patient handling errors and emergency vehicle movement/collisions are the most common adverse events resulting in tort (laws) against EMS. Other incidents are less frequent but incur higher individual costs. These findings highlight key areas for improving EMS patient safety.

The science of Stretcher lifting & loading

- Stretcher Load - #1 (CNLOAD01)
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!!!

2011....

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=C3kN6WF5xAA&feature=related

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

And now for some MYTH BUSTING

‘Safety’ approaches being driven by manufacturers claims and sales rather than by science and data
Rash of “Safety Concept” vehicles..... Devoid of substantive automotive safety engineering input or testing

Yet another potentially lethal example marketed as a ‘safety innovation’ YET outside of automotive safety practice

Airbags in the back....?? Hazardous for this environment

Absent safety testing standards, any meaningful crash or injury mechanism data or effective occupant positioning – as per the automotive engineers, rear compartment airbags are likely to be highly hazardous

“Our design features are focused on improving the safety of the patient compartment, and side roll protection in Horton ambulances helps reduce the threat of a fatal injury if a rollover occurs.”

Airbags ....?? Absent safety testing standards, any meaningful crash or injury mechanism data or effective occupant positioning – rear compartment airbags are likely to be hazardous

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

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]
  – [Fleet vehicles - ASSE/ANSI Z15]
- USA Other
  – Purchase Specification: KKK
  – “Standards” - AMD, ASTM F 20, NFPA (devel)
  – Guideline: EMSC Dos and Don’ts, and (ASTNA, CAAS and CAMTS)
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

USA KKK ambulance purchase specifications
- Specifications for the purchase of a 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

USA Ambulance Manufacturing Division (AMD)
Ambulance Standards – August 2007
- No dynamic or impact test
- No automotive test manikin
- Mandates NO ‘crumple zone’
- No impact tested anchorages for occupant restraint or equipment
- Internal, not independent


USA Ambulances: FMVSS Exempt
NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

176%«DQG\HDUVODWHU and still the same problem

Occupant protection......??
July 2007

May 13, 2010

2 killed in Iowa ambulance crash
2 dead and 3 injured in collision Thursday.

KKK/AMD – static ‘safety testing’
- Ignorant of automotive safety principles – and specifies -
  - 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.

FMVSS has a specific exemption for ambulance vehicles once you are 600mm or 2 feet positioned rearward of the driver.
KKK require a ‘national test lab’ to conduct AMD ‘tests’ BUT NOT an automotive test lab!
No dynamic impact tests AT ALL
No crashworthiness tests

No ‘a’… then NO ‘F’ !!!!!
- F = ma
  - where F – force
  - m – mass
  - a – acceleration

Ridiculous current 2009 USA ambulance ‘safety testing’ !?!!? – IS NOT consistent with accepted automotive safety practice...

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

Emergency Vehicle Visibility and Conspicuity Study

Policy and practice ignorant of existing technical safety data

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 1995.

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

Muskoka EMS - Canada

Old design

New design

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

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?
What about changing driver behavior in the real world??

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

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

- 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.
ACETECH™ Auto Vehicle Informatics (AVI) key features

- Vehicle Status
- Operational and Fleet Reports
- Speed and Fuel Monitoring
- Axis Incident Report
- Fuel Monitoring
- Real Time Delivered Order History
- Asset Management

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
  - Fewer collisions
  - Reduced injuries
  - Plus: Panic/emergency button to alert to operations

THE ACETECH™ AVI advantage

- Asset management of
- Integrates to
- Fleet
- Software
- Call center
- All assets
- On/off, stores and
- Lease
- Speed, Batteries
- Dispatch the closest, most appropriate unit.
- Operational and
- Lone Worker
- Behaviour,
- Reduced fuel expense
- Reduce Carbon emissions
- Reduce response times
- Fewer collisions
- Reduced injuries
- Plus: Panic/emergency button to alert to operations

Telematics

- “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

GGD Smartphone views

Example scorecard of comparative driver performance from the ggdrive business application.

Example trip trace from the ggdrive business application.

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.

How did the UK pilot drivers perform??
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

Harsh Braking per 100 trips

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

2012 TRB EMS Safety Summit

- Safety Systems, Strategies and Solutions Summit
- Held on site DC and online Feb 29 2012
- Auspices of the National Academies of Science, Medicine and Engineering

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!!
**The 2012 TRB EMS Safety Summit**

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

### Sessions

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

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**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

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**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

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**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.

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**R & D “Ripoff and Duplicate”**

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

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**EMS Safety Foundation Ambulance Vehicle & Ergonomics Workshop, October 2009**

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**The EMS Safety Foundation**

- www.EMSSafetyFoundation.org

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**The EMS Safety Foundation: A practical and functional model**

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

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**Automotive engineers addressing EMS Safety Foundation Workshop**
EMS Safety Foundation

Ambulance Innovation Workshop and Design Clinic

Session A
Vehicle Safety and Occupant Protection
Gene Lukianov

Session B
Hands-on human factors operational safety and task analysis
Chris Fitzgerald

October 2nd, 2010

International approaches

- The state of the art non-USA vehicles have NO squad bench nor the after market structural vehicle modifications that can potentially decrease crashworthiness integrity that were seen in study vehicles.

EMS Safety Foundation Delegation seeking out International Innovation

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/intern/Safety/Live-From-RETTmobil/2551537
Vehicle Occupant Safety design

European design

Safety technology is a key focus
Safe and Ergonomic design

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)

Ergonomic layout and equipment

Patient Transferring Slides
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
EMS SAFETY COURSE
National Association of Emergency Medical Technicians

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

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)
www.NAEMT.org
or email info@naemt.org

Tips for Emergency Vehicle Operations

USFA Emergency Vehicle Safety Initiative

Traffic Incident Management Systems (TIMS)
- Released April 2008
- FEMA, USFA, IFSTA
- Covers setting up safe roadway incident work areas and using unified command at these incidents

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

USFA Emergency Vehicle Safety Initiative

Traffic Incident Management Systems (TIMS)

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

This vehicle is safety crash tested by automotive experts

Unlike this vehicle

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

Fleet Mix?

Were we safer in the Cadillac???

What do we know works...
- Vehicle Operations Safety Policies
- Squad bench lap seat belts
- Patient over the shoulder belts
- Securing equipment
- Forward and rear facing seating
- 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

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

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