Who am I?
- Nadine Levick MD, MPH
- Emergency Medicine Physician and Public Health Academic, USA (Hopkins, Harlem, Maimonides, Brooklyn & Australia – Royal Melbourne, Royal Children’s 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

Patient safety... and provider and public safety too? “It’s an unsafe system... why?”

What I hope to cover today
- Ambulance transport safety “is part of a system”
- Issues with Ambulance manufacturing
- Need for measurement for safer performance
- Creating a ‘culture of safety’ thru awareness, training, design, technology and incentive.

Safety Innovation
- New Fleets
- New Policies
- The Cloud and what it can do for EMS
- New Fleet management technologies
- New back strain monitoring
- Peds transport issues
- New Platforms
- New Safety Initiatives

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

Canada - EMS Safety Leaders
- The West
  - British Columbia
  - Alberta
  - Saskatchewan
  - Manitoba
- The East
  - Ontario
  - Quebec
  - New Brunswick
  - Nova Scotia
  - Prince Edward Island
  - Newfoundland
- The North
  - Yukon Territory
  - Northwest Territory
  - Nunavut

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

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
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

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?

Tragedy you don’t want to be involved in

Dec 8, 2010
EMS worker killed in tragic northern Alberta crash

Ambulance truck hit by trailer that later Career from truck bearing multi-vehicle wreck.

Patient Safety UK- A routine concept…

October 19th, 2010

But Patient Safety is just one part of this system
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.

Safety of the...

- Provider
- Public
- Patient

Safety is a tool to save

- Lives
- Time
- Money

must be evidenced based

Some odd USA and also Canadian 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??

- Transport Canada announced that effective August 31, 2011, automakers must install Electronic Stability Control (ESC) technology in Canadian vehicles.
- 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!....
Ontario EMS Occupant Safety
30 August 2010

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

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

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

Denominator ….?
- # vehicles
- # types of vehicles
- # runs
- # miles/kms
- Nature of patient
- Severity of patient

Balance of concerns and risk during transport
- Response and transport time
- Clinical care provision
- Occupant safety/protection
- Public Safety

Is response time really a meaningful measure of patient outcome??
- What are the confidence limits?
- What about demographics, population density?

Jan 2010 - Evaluating Trauma Management Performance in Europe
Yongjun Shen, Elke Hermans, Da Ruan, Geert Wets, Tom Brijs and Koen Vanhoof

Data Envelopment Analysis
- # EMS Stations/10,000 citizens
- # Staff/
- # EMS Transportation Units/10,000 citizens
- # EMS response times/1000 km2 area
- # EMS response times/100 km rural road length
- # EMS response times/1000 km2 area
74% of EMT occupational fatalities are MVC related

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 - ~50,000 (Type I, Type II, Type III: Freightliners, ?motorcycles)
- Transports - ~50 million (to Emergency Deps ~ 50%, < 1/3 emergent)
- Cost - $8 Billion annually
- Safety Oversight - ? Disparate

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 injury
- More likely to crash at an intersection with traffic lights  (37% vs 18% p=0.001) & more people & injuries/crash than similar sized vehicles#
- And there have been all sorts of major transportation safety is the major and most 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

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

New Information/Technical Developments Jan 2006 - Jan 2011
- Transportation Safety Innovation Program (TSIP) - Vehicle Safety Components - April 2007
- National Academies TRB - Inaugural EMS Safety Commission meeting - Jan 2008
- Transportation Safety Innovation Program (TSIP) - Vehicle Safety Program - Jan 2007, 2008
- Enhanced Safety of Vehicles (ESV) - publications May 2010, 2011
- Enhanced Safety of Vehicles (ESV) - December 2012
- Enhanced Safety of Vehicles (ESV) - November 2013
- Enhanced Safety of Vehicles (ESV) - May 2015
- Enhanced Safety of Vehicles (ESV) - December 2016
- Enhanced Safety of Vehicles (ESV) - October 2017
- Enhanced Safety of Vehicles (ESV) - December 2018
- Enhanced Safety of Vehicles (ESV) - February 2019
- Enhanced Safety of Vehicles (ESV) - December 2020
- Enhanced Safety of Vehicles (ESV) - December 2021

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 existing technical engineering science

Occupational transportation fatalities...
- 9% were cardiovascular
- 9% were homicide
- 4% needle sticks, electrocution, drowning and other

And...
- 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

WE HAVE A BIG PROBLEM HERE
- Injuries caused by poor visibility (Type I, Type II, Type III: Freightliners, ?motorcycles)
- And there have been all sorts of major technical and informational developments since Jan 2006

And what is killing EMS?
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- Enhanced Safety of Vehicles (ESV) - December 2021

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 existing technical engineering science
Some new dimensions
- Vehicles – smarter, sleeker, safer – CHEAPER!
- Operations – new technology tools
- Interdisciplinary infrastructure – new global platforms

Systems safety of:
- Travel to and from the scene
- 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

Safe Systems Approach

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 survivable impact?
- $E = \frac{1}{2}mv^2$
- $v^2 = 2as$

12 mph (20 km/hr)?

What is a survivable impact?
- $E = \frac{1}{2}mv^2$
- $v^2 = 2as$

~ 30 mph - survivable

What is a survivable impact?
- $E = \frac{1}{2}mv^2$
- $v^2 = 2as$

~ 60 mph – not survivable
A survivable impact??

Thursday July 5th......
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

April 30, 2009 - Tennessee

June 17th 2008
A paramedic and a patient killed

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

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

Creating a Safety Culture

within a company safety 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

Is it your service’s tragic year?
An ambulance is not an ED/ICU on wheels

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 related aspects -
- Impact Biomechanics
- Transport Ergonomics
- Fleet Safety

A "Fleet" to many in Emergency Medical care means....

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

Have you ever driven impaired/distracted?

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

The impaired driver

April 14th, 2008

Have you ever driven impaired/distracted?

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

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

Golden Hour – not so hot

- March 2010

Annals EM

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...?

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.”

NAEMT July 2006 Position statement

Policy makes a difference…

Are you self insured???

Very Scary insurance data – the $10 million dollar EMT

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<th>Medical</th>
<th>Total</th>
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<tr>
<td>1998</td>
<td>9.6</td>
<td>411</td>
<td>518</td>
</tr>
</tbody>
</table>

Workers Compensation Rate increased by 27%

An increasing 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

EMS CANNOT Afford to keep paying out like this…

Safety is Good Business
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

40 mph dry

44 feet

40 mph wet

220 feet

* Stopping distance: Perception time + Reaction time + Vehicle braking time

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

A few key words about restraint systems...

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


Why do we do this?
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

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 sidefacing 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 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 are forward or rear facing and 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

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

Based on technically sound scientific principles
We should use the best safety practices demonstrated in engineering...

...in automotive safety engineering

and in ergonomics

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 (11%)
- EMS response or transport (8%)
- Lack or failure of equipment (4%)
- Other errors (9%)

Patient handling errors included:
- Stretcher or wheelchair “tips” (28%)
- Patient drops (31%)
- Injury during patient movement (19%)
- Patient falls (13%)

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

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??

Stretcher Load - #1 (CNLOAD01)

A stretcher system that doesn't harm your back... and your services wallet
The new Mondial Ferno
A 27 inch loading height
Size matters…. Less than 27 inches will save your back!!!!

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

Nascar Safety Expert

• On ambulance patient compartment
  “It is a death vault”

Tom Gideon,
Head of Safety, GM Nascar

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

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

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”

Global EMS Vehicle Safety Standards v Specifications and Guidelines

- EMS Safety and Performance Standards – Australia & New Zealand 4035
- 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” - NTEA – AMD, ASTM F 20, NFPA (ideal)
  - Guideline: EMSIC Dos and Donts, and (ASTNA, CAAS and CAMTS)

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 mankin
- Voluntary

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

NTSB 1979... and 30 years later and still the same problem
- 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

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

May 13, 2010
- 2 killed in Iowa ambulance crash
- 2 dead and 3 injured in collision Monday.
- 2 EMS fatalities

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...
Worker visibility Act: November 24th 2008

Here’s the real world at 6 ft...

August 2009 – Visibility review

Policy and practice ignorant of existing technical safety data

This addresses some very real risks, very creatively – and currently ONLY available in London Ontario!

Color-blindness affects 10% of the population

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.

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??
  - EVOC?
  - Simulators?
- Real time safety performance outcomes??
  - The effectiveness data strongly support real-time invehicle monitoring and feedback

What about changing driver behavior in the real world??

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

Innovation
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

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

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 “Feedback box”
Driver behavior monitoring and feedback device

Hardware fitted to the vehicle
Non hardware App Driven cellular technology

THE ACETECH™ AVI advantage
- ACETECH™ AVI – Vehicle Informatics
  - Know where your vehicles are
  - Dispatch the closest, most appropriate unit
  - Improved productivity
  - Reduced carbon emissions
  - Reduce risk (short response)
  - Fewer collisions
  - Fewer injuries
  - Plus Panic/emergency button is used in operations

The “Learn”
- All trips recorded (start/stop trip info)
- Established the benchmarks
- Alert Active
- "Guide"
- Speed feedback activated
- Smart Grid
- Automated application update
- "Sustainable"
- Messaging
- Incident Management
- IIA
A smart phone App that is a safety tool

Can we harness the foe??
- Smartphones are becoming ubiquitous
- The dangers of talking/texting and driving are clear and serious
- Education and policing have limitations
- Can we harness the enemy to advance and enhance road safety??

OK, so this is in total contrast to current ethos of the relationship btw cell phones and vehicle safety.

• VSSM (Visual System Status Management) provides a geographic view of call demand through the application of varying shades of color to indicate call density.

GPS and GPRS status
- A smart phone App that is a safety tool
- Driver and vehicle ids

Smartphones are becoming ubiquitous
- The dangers of talking/texting and driving are clear and serious
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Education and policing have limitations
- Can we harness the enemy to advance and enhance road safety??

How did the UK pilot drivers perform??

<table>
<thead>
<tr>
<th>Driver</th>
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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 pedestrian human factors issues

- Dissemination and Policy
  - Knowledge transfer
  - Standards, specifications and policy

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.

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

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

2011 TRB Summit

- Safety Strategies and Solutions Summit
- To be held on site DC and online Dec 12
- Auspices of the National Academies of Science, Medicine and Engineering

The EMS Safety Foundation

www.EMSSafetyFoundation.org

October 29, 2009 TRB Summit
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

- 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

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 aftermarket 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

Advisory Board and Technical Expert Panel
- EMS Safety Foundation, Director of Human Factors and Ergonomics
- Chris Fitzgerald, Injury and Risk Management

Guest Technical Expert
- Daniel Ronchi, Pro Active Medical – dorsaVi, Australia

Guest Technical Expert
- Andrew Ronchi, Pro Active Medical – dorsaVi, Australia
Guest Technical Expert
Jonas Liden, Industrial Design, Sweden

EMS Responder Rettmobil 2010 Delegation
http://www.emsresponder.com/web/online/Safety/Live-From-RETTmobil/25$13137
Vehicle Occupant Safety design

European design
Safety technology is a key focus

Safe and Ergonomic design

Safe and Ergonomic design

Safe and Ergonomic design

Patient Transferring Slides

Ergonomic layout and equipment

Flexibility to manage two patients
Texas - Careflite's new vehicle

Careflite's new vehicle

Manitoba's new fleet

The new Oslo Ambulance
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!!

Interdisciplinary Collaboration is what is key – not orthopedic folks talking to cardiologists – BUT collaboration between the health care folks appropriate automotive and occupant protection engineers and transportation system design, ergonomists and industry standards that make sense – and

Collaboration and Outcomes

- Interdisciplinary Collaboration is what is key – not orthopedic folks talking to cardiologists – BUT collaboration between the health care folks appropriate automotive and occupant protection engineers and transportation system design, ergonomists and industry standards that make sense – and
- Meaningful measures of outcome and performance

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
  - To prevent a crash
  - In the event of 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