EMS Safety Seminar:
The Cutting Edge and You!

Module 1 – Ambulance safety background & principles
Module 2 – Ambulance safety applied solutions & innovation

Who am I?
- Nadine Levick MD, MPH
  - Emergency Medicine Physician and Public Health Academic, USA-Hopkins, Columbia (SUNY), Montefiore & 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

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

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

EMS Safety Crisis
"The Chinese word for ‘crisis’ (危機) is made up of the words ‘danger’ (危) and ‘opportunity’ (機)"

In a nutshell…
- Understanding of the dangers in Ambulance Transport
- Overview of the opportunities to enhance safety

Outline
I. Review of data on ambulance crashes and safety standards and guidelines that exist for the ground EMS
II. Identification of ground EMS transport safety issues, hazards and areas of risk to patients, providers and public
III. Highlight unacceptable mythology and challenges to advancing EMS transport safety
IV. 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

Safety Dimensions
- Safe systems – CRM / transport system safety
- Risk perception
- Fleet and operations management
- Vehicle design safety
- Scene safety
- Patient Handling
- Health and wellness
EMS operations are identified to be high risk. This presentation outlines the concept of a systems engineering safety approach and innovations developed and developing to address the key determinants of the safe design of EMS vehicles.

Much of what you shall hear today is thanks to the work of all of those in the:

and the National Academies of Science, Medicine and Engineering Transportation Research Board's ANB105 EMS Safety Subcommittee

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

Your electronic handout

Your electronic presentation handout/resource link

How do you use this QR code?
Get Microsoft Tag reader App on your smartphone (free from your App store)
Open Tag App and scan the QR code

www.objectivesafety.net/PDFHO.htm

Or if you are < 30 years

Your Handout and Additional Resources

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
Emergency Medical Service Safety

- What are the transport and other 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?

Vehicle X

Vehicle Y

Some Canadian Standards

Emergency Medical Services (EMS)

An important and unique transport system

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

A tragic emergency health care intervention outcome

It does happen….

A devastating tragedy…

- An ETT down the wrong hole may kill your patient and be a terrible burden for the pts family and for the medic involved.
- BUT an EMS crash can kill all involved AND wipe out an EMS systems response capacity……
Now who have we here?
Are you –
- State EMS?
- Volunteer EMS?
- State Fire?
- Volunteer Fire?
- Hospital based EMS?
- Private EMS?
- Police?
- Nurses?
- Physicians?
- Administrators?
- Other?

Some questions I get asked
- What are the top concerns related to crashes?
- What are some of the key factors surrounding safety? Design, restraints, etc.
- What should crews demand from their agencies and what should agencies be providing? Monitoring systems, do they work?
- What doesn’t work.

A System of Safety

So what is safety?
- Condition of being protected against undergoing or causing harm, injury or loss

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

Systems safety of:
- Dispatching a vehicle
- Getting you, your patient and equipment to, in and out of the vehicle
- Providing patient care inside the vehicle
- Occasional protection in crash and near miss situations
- Public safety

Safe Systems Approach
- Do the clinical work that is required and essential
- Not get hurt or killed
- Not hurt or kill anyone else
- So...
- Clinical need
- Human tolerance of injury
Thursday July 5th 2007

Paramedic in Toretto Ambulance Crash

Friday July 20th 2007

The worst ambulance crash in USA history

Five Killed in Crash of Ambulance and Semi

Wednesday, July 24, 2007 - The four-vehicle accident occurred at about 2:45 p.m. near the intersection of Route 22 and Route 414 in Eldersburg, Md. According to the Maryland State Police, the ambulance was driving west on Route 22 when it collided with a tractor-trailer carrying recyclable materials. EMS personnel were transporting a patient from Carroll Hospital Center in Westminster to a hospital in Baltimore. Four of the five people killed were in the ambulance, including the driver and three paramedics, police said. The driver of the tractor-trailer was also killed.

Source: AP

© Newsday, All Rights Reserved

Published: July 24, 2007

The worst ambulance crash in USA history

Five Killed in Crash of Ambulance and Semi

The accident occurred on Route 22 in Eldersburg, Md., near the intersection with Route 414. The ambulance was transporting a patient from Carroll Hospital Center in Westminster to a hospital in Baltimore when it collided with a tractor-trailer carrying recyclable materials. The driver and three paramedics in the ambulance, as well as the driver of the tractor-trailer, were killed. Emergency personnel were on the scene of the crash, which involved four vehicles, including an ambulance and a tractor-trailer.
So what are we going to cover today??

- What we know now, and need to do
- What is there for the forward thinkers
- The future horizons

So

- What's important
- What's not important

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

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

- What is factual
- What is garbage

- What is new
- What is not new

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

Congratulations to Winthrop Ambulance Service
A lot has happened in 8 years

Key Safety dimensions
- Clinical task performance
- Ergonomics/Human factors
- Biomechanics and crashworthiness

Safety of the...
- Provider
- Public
- Patient

Safety is a tool to save
- Lives
- Time
- Money

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 timeline
- Didn’t know it was an issue – 60’s-70’s
- Knew it was an issue – but didn’t really know what to do – 80’s-90’s
- Safety technical data rolls out – past 10 years
- Change and adoption challenges – we are here now

Goals
Better, safer and cheaper
Safety Performance

- Measurement
- Outcomes
- Technical expertise

Safety Dimensions

- Safe systems – CRM / transport system safety
- Risk perception
- Fleet and operations management
- Vehicle design safety
- Scene safety
- Patient Handling
- Health and wellness

Some new aspects

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

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

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 Occupational transportation fatalities...

- WE HAVE A BIG PROBLEM HERE

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

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
Are you self insured???

Very Scary insurance data – the $10 million dollar EMT

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Workers Compensation Rate increased by 27%

A problem

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

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

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

Expensive....

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

Transport Medicine

Key elements to safety
- 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

Safer Better Cheaper is NOW
- What are the practices that are costing us
- How to identify optimal safety improvements
- How to facilitate the integration of new safer practices
  - Sure a Culture of Safety, but the road map to get there is the key

Safety concepts out there now
- Wireless physiological sensors
- Driver feedback technologies
- Tiered dispatch
- Enhanced ambulance vehicle design
- Intelligent Transport Technologies – ITS
- New platforms for interdisciplinary exchange
- New Safety Standards
- Ambulance drones!

Communication Technology trends

Smartphone navigation devices

Compass process

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

1864 Ambulance Design Patent and diagrams
Almost 150 years ago
1980’s Then….

And NOW!…

USA 1980’s Then….

And yes now…

Poor interior design exposes YOU to unnecessary hazards

Equipment hard to reach

Head ripper off Harness AND Head Strike zone hazards

Innovation Yes 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?

And yes, this meets KKK or NFPA
Your work environment!!

August 2009 – Impaired…
He sure did not expect to be in that situation when he started his shift that day

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

Ground Ambulance Transport Safety IS Complex AND Multidisciplinary

Occupant protection……??

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

Ambulance Design and Standards ??

- KKK
- NFPA
- SAE
- ASTM 1517
- NASEMSO MVDR
- CAAS/GVS
- CAMTS
- FMVSS
- FMCSA

State required ambulance equipment
International: CEN 1789, ASA 4535, Indian St
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..

\[ \text{Philosophiæ Naturalis Principia Mathematica}, \text{July 1687} \]

\[ \text{What are your policies??} \]

– 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?

\[ E = \frac{1}{2} m v^2 \]
\[ v^2 = 2a \]

\(- 30 \text{ mph} - \text{survivable}\)

\(- 60 \text{ mph} - \text{not survivable}\)
A survivable impact??

A serious problem...

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

USA EMS

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

USA EMS transport safety data estimates

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

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

EMS Safety Foundation
Safety Road Map Project
focus steps in safety as a system of improvement with milestones eg. BHP example

Safety Road Map

- Not just a conceptual model
- Must have tangible steps
- Must be systems focused
- Measurable elements
- Immediate, short, medium and long term goals
- Reward and recognition driven

Which of these two vehicles would you want?
Sprinter v Ford Transit crash test
http://www.youtube.com/watch?v=CNiW5j6EaAA&feature=related
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?

A tragic emergency health care intervention outcome

But what about head protection?

New EMS helmet prototypes

Carl Craigle EMT-P, Chief Platte Valley Ambulance, CO

Emergency Vehicles – Viewer Awareness

For a timely, appropriate and safe response

• Location
• Size
• Shape
• Speed
• Intended path

Policy and practice ignorant of existing technical safety data
But whatever color …. If you run a red light someone will be killed.

Day visibility

Night visibility

- Having access to that technical knowledge supports changes to improve safety practice.

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

Vehicle Crashworthiness testing

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

...in automotive safety engineering
**The Crash Event - Crash Testing**

- An introduction
- What one needs to know
- What do the tests really mean
- And, what tests are meaningful

**Intrusion vs Deceleration**

- Intrusion = vehicle to vehicle or vehicle to fixed narrow object
- Deceleration = sudden stop – ie. sled test

**Dynamic Safety Testing**

- requires sophisticated, expensive equipment
- measurably demonstrates forces generated during collision
- accepted international standard for vehicle restraint systems

**Full Vehicle Crash Tests**

- Test 1 - Right side impact
- Test 2 - Frontal

**Intrusion**

- 2000 Full Vehicle Crash Testing
- Pre-impact CTD positioning

**Testing the real world**

- And this all takes place in 60 milliseconds – the blink of an eye
A few key words about restraint systems…

Beware some provider restraint systems are dangerous

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

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

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 for side-facing occupants are potentially lethal – and is in NO WAY SUPPORTED BY ANY DATA OR AUTOMOTIVE SAFETY EXPERTISE

Vehicle design and safety

• The principles of automotive safety involve a complex science, engineering technical skill, expertise, training and knowledge
• ‘Give the engineers a working list of our needs and let them tell us how it should be built to accomplish those tasks…..’

Dynamic Sled Testing of Ambulance Pediatric Restraints

If we know this – and its published….
Why do we do this?

Immobilization board on the stretcher, or even squad bench BUT NOT CAPTAINS CHAIR

Basically...

- DON'T put child in the front seat
- DON'T put the child on the rear facing captains chair
- Just about anywhere else is OK!
- Use a child seat when medically appropriate and size fits, well secured

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

Some powerful comments from the panel

- Remove the cabinets from the roadside wall
- Have your equipment on your side
- Learn to say no to unsafe practices
- Speak out with safety information
- Minimize use of code 3 response
- Regional safety forum interest
Key concept re: design of ambulance vehicle interiors

- Involves interrelationship of transportation safety and the human factors and ergonomic aspects for the patient, provider and public.

Range of reach. This is a well defined technical science

The result of the frequency analysis, green dots mark equipment used every time the ambulance is driven, orange every day, red every week.

Michael Hartford – Limington Fire Dept
https://www.youtube.com/watch?v=3T2fAVK__Xs

Some concerning approaches

- Flawed design assumptions
- Unsafe from an automotive safety perspective
- Providers can’t fit in
- Can’t reach patient or equipment from seated position
- VERY expensive

Flawed design assumptions lead to flawed design

Design Assumptions
- Designs are based on requirements and criteria
- Design is not ‘standards-driven’ and only meets the purpose of ambulance national standards
- One patient on cot, one stable back boarded patient
- Ensure good reach for EMTs
- Cables, tubing, & leads are routed along railings
- Design does not necessarily address constraints
- CPR ventilation cannot be performed if knee needed
- RT bag will be hung prior to travel
- Grounded rail boxes in the primary mode used
- Jump rings are the primary storage for immediate care items

Occupant safety and access hazards

Conceptual Design

How many Medics have a 2 inch deep waist line??

Roadside Seat

Most unfortunate

- These designs are:
  - very, very expensive
  - have dreadful human factors and ergonomics
  - can’t reach patient or equipment
  - NO functional automotive safety features
  - many dangerous impact hazards
Safety is Good Business

Rules/Policies Addressing Known Hazards

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

Dec 2011, New FMCSA Hours of Service


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

What are the solutions?
- Training?
- Practice Policy?
- Transportation Systems Engineering?
- Automotive Engineering?
- Education of other road users???

A lot is now possible and for less!
- Driver behavior
- Vehicle behavior
- Roadside ITS
- Fuel consumption/Economics
- Resource modeling

Innovation!

Fleet Management technologies
- FleetEyes – Intermedix
- ACETech/Ferno
- Zoll roadsafety fleet management systems
- Drivecam
- Marvis
- Telematicus
- InThinc
- Optima
- Northrop Grumman

Telematicus

GPS and GPRS status
GGD views
A smart phone App that is a safety tool

FleetEyes

Telematicus

SDM views
Telematicus

Vehicle database
- Individual vehicle/Checklists
- Link to other systems (SAP, Fleet)

Maintenance & Service Plans
- Repair history & Scheduling
- Action planning

Reporting
- Export to Excel for manipulation
- Scorecard views, Crystal Reports reporting
- Direct Feedback
From NASCAR to EMS
There are now places to turn for independent safety technical info and resources
And.. what is innovation?
*Something new, original and more effective

EMS SAFETY COURSE
National Association of Emergency Medical Technicians

NAEMT Safety Course
• Crew Resource Management
• Emergency Vehicle Safety
• Scene Operations
• Patient Handling
• Provider, Patient & Bystander Safety
• Personal Health

For more information on how to sponsor a course,
 ✓ go to www.naemt.org, click “EMS Safety”
 ✓ call 1-800-346-2368 (1-800-34NAEMT)
 ✓ email info@naemt.org
 ✓ visit “NAEMT EMS Safety” on Facebook

Hot off the Press!!!
CAMTS reference entitled: “Safety and Quality in Medical Transport Systems: Creating an Effective Culture”

WE DO HAVE TECHNICAL DATA!!!
What are global best practice models
Making it happen
How can we translate global interdisciplinary best practice initiatives to North American EMS

Safety Systems, Strategies and Solutions Summit Feb 2012
- ~50 onsite – lead representatives
- Live online participation with international representation
- 7 focus areas and a panel
- >120,000 downloads of presentation handouts
- Multi-Media ‘e-document’ with QR tags
- You tube overview

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

Its out there NOW
- TRB 2012 Summit – addressed the key and interdisciplinary applied solutions issues, in one day – please seek that information out.
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Your TRB EMS Safety Systems, Strategies and Solutions Summit Multimedia Document
http://www.emssafetyfoundation.org/2012TRBSummitMultimediawithLinksBW.pdf

Some info about the
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

The EMS Safety Foundation: A practical and functional model

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

R & D
“Ripoff and Duplicate”
- Avoid reinventing the wheel at all costs
- Where are the best practices that we need to transfer knowledge from

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 by promoting and advancing EMS safety innovation, collaboration, research, knowledge transfer, education and safety information dissemination

In a nutshell

- EMS Safety Foundation is a not-for-profit multidisciplinary virtual think – tank and test bed for safety innovation and knowledge transfer
- It is a virtual network integrating the end users and the technical experts
- A tool to enhance the safety of delivery of EMS services

World Expo/EMS Safety Foundation Safety Innovation Awards

- 12 product winners
- special mentions
- Criteria
  - Safety Innovation
  - Practical/Usability
  - Cost Efficiency

2014 awards just announced at Expo 2015

EMS Safety Foundation Ambulance Vehicle & Ergonomics Workshop
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

INDEMO Project – INDEMO 1.0
- INDEMO EMS 2013, 14 Texas EMS, EMS Chiefs Ontario 2014, Virginia EMS 2015, EMS Today 2014, Italy, France
- And, telepresence Robot 1.0 deployed nationally and internationally 2015 & 2016
- Voice activated Commands for INDEMO Project 2015-16
- National Academies TRB Summits 2008, 09, 12 & 17
- Rettmobil Delegations 2008-2016
- Interchuck delegation 2015
- Medevac: Vision Zero on SETONP Project Phase 1 funded 2013
- SETONP White Paper released 2015
- Rettmobil 2.1 place, AHA Inaugural Open Innovation Challenge 2014
- Keynote @ India EMS Innovation Conference 2013
- Keynote @ Malaysia EMS Safety Conference 2012
- Above all worked with hundreds of amazing folks all over North America and the world

So What is RETTmobil??

So What is RETTmobil??

So What is RETTmobil??

A major European Emergency Rescue Congress, Trade show and Symposium
- Held in Fulda, Germany
- Established in 2001
- Attended by ~ 25,000 attendees
- Brainchild of Prof Peter Sefrin
- Over 500 exhibitors, >20 Countries!

Milestones, many…!

- INDEMO Project – INDEMO 1.0
- Rettmobil 2016
- www.EMSSafetyFoundation.org/Rettmobil2016interestForm.htm
- International approaches
- European, non-north American vehicles have NO squad bench nor after market structural vehicle modifications that can potentially decrease crashworthiness integrity

A MUST READ for EVERYONE in EMS

Rettmobil and the Future of EMS Safety

What other innovators believe in your industry?

So What is RETTmobil??

RETThmobil is -

A MUST READ for EVERYONE in EMS

Rettmobil and the Future of EMS Safety

What other innovators believe in your industry?

So What is RETTmobil??

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Milestones, many…!

- INDEMO Project – INDEMO 1.0
  - INDEMO EMS 2013, 14 Texas EMS, EMS Chiefs Ontario 2014, Virginia EMS 2015, EMS Today 2014, Italy, France
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- Held in Fulda, Germany
- Established in 2001
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- Brainchild of Prof Peter Sefrin
- Over 500 exhibitors, >20 Countries!

Milestones, many…!

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A MUST READ for EVERYONE in EMS

Rettmobil and the Future of EMS Safety

What other innovators believe in your industry?

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Birds eye view

EMS Safety Foundation Delegation seeking out International Innovation

Live from Rettmobil 2013
Public Access – www.EMSSafetyFoundation.org

EMS Safety Foundation’s
Live @Rettmobil 2013 on YouTube!!
Click here
https://www.youtube.com/watch?v=kJw9_pylR0

Prof Sefrin Rettmobil 2013 Interview with Dr. Levick, AJ Heightman and Scott Craven
https://vimeo.com/67062815
From Allan’s iphone in Connecticut
Stretcher by roadside wall

Stretcher right by provider

Awkward tasks? Develop solutions!
The old expensive and not versatile and the new...

Rapidly and game changing technology and cheaper, better, very versatile.

Are you interested to Join the Rettmobil Delegation May 11-13, 2016?

http://www.EMSSafetyFoundation.org/Rettmobil2016interestForm.htm
Virtual Rettmobil 2016 attendance

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

Ambulance Safety Innovation Design Module 1.0

http://www.INDEMO.info

the future you can have right now!!!

Better, safer and cheaper

Innovation Design Module (INDEMO) 1.0

• A full scale interactive physical model
• Change in ambulance design based on technically sound automotive and ergonomic science
• Improvement potential could be developed, visualized, demonstrated and evaluated.

EMS Safety Foundation’s new demonstration Project: Ambulance Safety INDEMO 1.0

• Designs so that you can do your work with optimum safety and efficiency.
• Based on state of the art science, practice and input from the world’s leading experts in automotive safety and human factors.
• Designs that are cheaper, better, safer.

EMS Safety Foundation’s new demonstration Project: Ambulance Safety INDEMO 1.0

Better, safer and cheaper
This project focused on system of safety as a central part of the operational process, not a parallel aspect. Vehicle dimension selection was based on automotive safety testing parameters, the interior layout based on integrating pilot task analyses with a range of ergonomic technical data across a spectrum from seating to reach parameters and across body size range.

Workshops with INDEMO on site or offsite
Don Hudson Award presentation

2015 “Bill” Leonard Commitment to EMS Safety

Schedule a telepresence session with INDEMO and Andi

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

You can have a virtual tour of INDEMO 1.0 or an onsite visit to your site/conference

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

Working smarter not harder!

Innovation in Practice
American Ambulance, Fresno CA
So let's take a look at those vehicles outside.
Other new tools we have now

Google Glass May Help Emergency Physicians Improve Patient Care

From Wired August 2014

The $500 Display Makes Your Junker Car Feel Like a Fighter Jet

http://www.visimobile.com/visi-product-info/

Wearable tech..
93 per cent of Jawbone users in cities < 24 kms from epicentre woke up suddenly at 3:20 a.m

The ambulance response vehicle of the future?

And even now AED Drones!

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

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

Solutions we know work…

- Tiered dispatch
- Vehicle Operations Safety Policies
- Ideally, forward and rear facing seating
- If not, use squad bench lap seat belts
- Patient over the shoulder belts
- Securing equipment
- Fleet management 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
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### Future directions
- Meaningful Goals
- New policies
- New practices
- New standards
- New vehicles
- New technologies

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

### Key dimensions
1) safety must be inherent to operational process design
2) engagement of appropriate interdisciplinary expertise in systems design and safety analysis is essential
3) an understanding of the complex interplay between patient, provider and public safety from a systems perspective and culture is key to addressing effective and safe operational EMS performance.

### 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 technically 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
Your electronic presentation handout/resource link

Or if you are <30 years

www.objectivesafety.net/PDFHO.htm

Electronic handout and resources available online
http://www.objectivesafety.net

Thank you!
Any Questions??

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