Mile High RETAC
EMS Safety Summit, Denver 2015
August 28th, 2015

EMS Safety and Innovation:
The Cutting Edge and You!

outlinen

1. Review of data on ambulance crashes and safety standards and guidelines that exist and are being developed for ground EMS
2. Identification of ground EMS transport safety issues, hazards and areas of risk to patients, providers and public
3. Profile innovation, new safety technologies and strategies and knowledge transfer to enhance safety and reduce risks of ground EMS and patient transport

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

And.. what is innovation?
• Something new, original and ? more effective

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

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 ANB10(5) EMS Safety Subcommittee

A huge thank you to all those from all aspects of the industry and operations who have made all this special work possible

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

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

There are now places to turn for independent safety technical info and resources
- National Academies TRB
- NAEMT
- EMS Safety Foundation

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 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

EMS Safety 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 right now

Better, safer and cheaper

Key Innovation - NOW

- Achievable today
- The only thing keeping us from it ….. IS US!!

Fleet management tech tools

- Fitted Invehicle
- Smartphone based

Really clever AND simple pt belts

Smarter stretcher platforms

Stretcher by roadside wall

Stretcher right by provider

Science based design

Ambulance Safety Innovation
Design Module 1.0
www.INDEMO.info
the future you can have right now!!
Better, safer and cheaper

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

Letter to Abe Lincoln – 1864
re: safety of ambulance design
1864 Ambulance Design Patent and diagrams
Almost 150 years ago

USA 1980's Then....
And yes now...

Poor interior design exposes YOU to unnecessary hazards

Equipment hard to reach

Innovation Yes Now...
But avoid repeating old mistakes!

A System of Safety

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.

Safe Systems Approach

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
- Occupant protection in crash and near miss situations
- Public safety

Safe Systems Approach

System Design Constraints
- Do the clinical work that is required and essential
- Not get hurt or killed
- Not hurt or kill anyone else
- Clinical need
- Human tolerance of injury

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 safer?
- 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?

July 2015
January 2014

Doctor killed in latest mowedown horror

EMS Safety

This could be you….

He sure did not expect to be in that situation when he started his shift that day

EMS Safety

Operational practice decisions, vehicle choice, visibility and the location of the sharps container…. key issues here

EMS Safety

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? and… where is your sharps container??

EMS Safety

What is a survivable impact?

12 mph (20 km/hr)?

EMS Safety

What is a survivable impact?

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

v^2 = 2as

EMS Safety

~ 30 mph - survivable
What is a survivable impact?

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

~ 60 mph – not survivable

A survivable impact??

A serious problem…

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

A tragic emergency health care intervention outcome

But what about head protection?

New EMS helmet prototypes

Head protection @ EMS Expo

Carl Craigle EMT-P, Chief Platte Valley Ambulance, CO
Visibility and lighting issues

Day visibility

Night visibility

Policy and practice ignorant of existing technical safety data

Emergency Vehicles – Viewer Awareness

For a timely, appropriate and safe response

- Location
- Size
- Shape
- Speed
- Intended path

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

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

- Perception time + Reaction time + Vehicle braking time
- (varies with age, skill, agility, attention - vehicle type, tire pressure, road etc)

20 years ago…

and now… July 2015

automotive safety engineering data

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…

Dynamic Sled Testing of Ambulance Pediatric Restraints (a resident research project)

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


Immobilization board

Foldable 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

NAEMT July 2006 Position statement
Stretcher patients must be in the overhead shoulder belts, medics restrained in seat belts and equipment secured.

Clever pt shoulder belts

NOT new technical data...

Beware some provider restraint systems are dangerous

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

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

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

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
- Desks are based on requirements and constraints
- Design is not “standard” and only serves the purpose of satisfying optional standard
- One patient on cot, one stable back boarded patient
- Length wise configured inpatient cot
- Cables, tubing, & leads are routed along vertical wall
- Design does not necessarily address constraints
- CPR equipment cannot be performed while seated
- IF bag will be hung prior to travel
- Cuts/holes in vehicle to the primary needs used.
- Jump/sprag are the primary storage for immediate care items

Occasional safety and access hazards

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

Roadside Seat

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


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
>230,000 downloads of presentation handouts
Multi-Media ‘e-document’ with QR tags
YouTube overview

TRB EMS Safety Systems Strategies and Solutions Summit
Session 1

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

Your TRB EMS Safety Systems Strategies and Solutions Summit Multimedia Document
http://www.emssafetyfoundation.org/2012TRBSummitMultimediawithLinksBW.pdf

So scientific evidence clearly shows!

Use fleet management tech
Use patient stretcher shoulder straps
Wear your lap belts

Some info about the

http://www.emssafetyfoundation.org/2012TRBSummitMultimediawithLinksBW.pdf
EMS Safety Foundation
In a nutshell
- is a not-for-profit multidisciplinary virtual think–tank and test bed for EMS safety innovation and knowledge transfer
- It is a virtual network integrating innovative forward thinking end users and the technical experts from diverse non-clinical disciplines
- A tool to enhance the safety of delivery of EMS services

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

EMS SAFETY COURSE
National Association of Emergency Medical Technicians

NAEMT EMS Safety Course Committee

NAEMT EMS Safety Course
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

CAMTS - “Safety and Quality in Medical Transport Systems: Creating an Effective Culture”

Innovation!
Out there now!!

Vehicle Electronic Stability Control - ESC

Smart stretchers - hightech
Clever Stretchers – low tech

Smart Loading systems

Clever bag design

International approaches
• European, non-north American vehicles have NO squad bench nor after market structural vehicle modifications that can potentially decrease crashworthiness integrity

Retmobil 2015, May 6-8

EMS Safety Foundation Delegation seeking out International Innovation
Awkward tasks? Develop solutions!

The old expensive and not versatile and the new... Rapidly and game changing technology and cheaper, better, very versatile
Ambulance Safety Innovation Design Module 1.0
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.

You can have a virtual tour of INDEMO 1.0 with Andi at EMS Expo or schedule INDEMO to visit your site/conference.

http://www.emssafetyfoundation.org/INDEMOScheduleForm.htm
Other new tools we have now

Google Glass May Help Emergency Physicians Improve Patient Care

From Wired August 2014

This 500x Display Makes Your Junker Car Feel Like a Fighter Jet

Wearable tech...

Wireless Physiological Monitoring
http://www.visimobile.com/visi-product-info/

AED Drones!
A lot is now possible and for less!

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

Tech advancements

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

Cutting edge Technology for fleet management

- Invehicle fitted technologies
- Smartphone based technologies

Fleet Management technologies

- ACETech/Ferno
- FleetEyes – Intermedix
- Zoll rescuenet and road safety fleet management systems
- Marvis
- Telematicus
- Optima
- Northrop Grumman

A smart phone App that is a fleet safety tool

Future horizons – the Ferno IPTS platform

New vehicle modalities

Telematicus

- Fleet Management capability
- Vehicle database
- Individual vehicle data
- Fleet mileage collection (checklist)
- Link to other systems (SAP, Fleet)
- Maintenance & Service Plans
- Repair history & scheduling
- Action planning
- Reporting
  - Dispatch & follow-up for manipulation
  - Homework log, digital reports
  - Incident feedback

Invehicle fitted technologies

Public Alerts

Resource modeling

CAD

Fuel consumption/Economics

Roadside ITS

Fleet performance –

Feedback: Directly to drivers at the wheel

Resource allocation

- Monitoring: System that gives management data of vehicle efficiency and use

- Public Alerts

Driver behavior

Vehicle behavior

- CAD

- Resource allocation

- Fleet performance –
  - Monitoring: System that gives management data of vehicle efficiency and use

- Public Alerts

Driver and vehicle ids

Fleet Management capability

Vehicle database

- Individual vehicle data

- Fleet mileage collection (checklist)

- Link to other systems (SAP, Fleet)

Maintenance & Service Plans

- Repair history & scheduling

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Reporting

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Future horizons – the Ferno IPTS platform

New vehicle modalities
The ambulance response vehicle of the future?

And now Ambulance Drones!

Innovation Consortium?

Are you interested in the EMSSafety Foundation?

Your electronic presentation handout/resource link

www.objectivesafety.net/PDFHO.htm

Key dimensions

1) Safety must be inherent to operational process design – interplay between patient, provider and public safety from a systems perspective is key for innovation in addressing effective and safe operational EMS performance

2) Engagement of appropriate interdisciplinary expertise in systems design and safety is essential

3) Use fleet management tools, use your lap belts and pt shoulder belts AND use science-based design!

4) We HAVE innovative technical safety info now

5) Get ready for adoption of rapid innovation!! .

Thank you!

Any Questions??

Electronic handout and resources available online

http://www.objectivesafety.net

www.objectivesafety.net