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

Who am I?

- Nadine Levick MD, MPH, FACEM, FRACGP
- Emergency Medicine Physician and Public Health Academic (USA- Johns Hopkins, Columbia/Harlem, Maimonidies, Montefiore; Australia – Royal Melbourne, Royal Childrens Hospitals, Royal Australian Flying Doctor Service; now Israel – Assuta Ashdod Hospital, Ben Gurion University)
- Inaugural Chair, EMS Transport Safety Subcommittee, TRB, National Academies, USA
- Founding Principal Investigator of PECARN
- Founder of EMS Safety Foundation
- Founder of Objective Safety Information Portal
- Recipient, International Society of Automotive Engineers, Women’s Leadership Award for EMS Safety

Global Innovations and EMS Safety Research

Nadine Levick, MD MPH
Research Director, EMS Safety Foundation
CEO, Objective Safety
Chair, TRB, EMS Safety Subcommittee, National Academies
Director of Research and Innovation, Emergency Health Services
Assuta Medical Center, Ashdod, Ben Gurion University, Israel

Today’s Outline

- Historical perspectives
- New World Order
- Key determinants
- Innovation dimensions
- Cheaper Better Safer
- Open source
- Challenges

Leadership and Innovation

- “Being responsible sometimes means pissing people off… By procrastinating on the difficult choices, by trying not to get anyone mad, and by treating everyone equally "nicely" regardless of their contributions, you’ll simply ensure that the only people you’ll wind up angering are the most creative and productive people in the organization.”

Leadership and Innovation

A Leadership Primer from General (Ret.) Colin Powell, Former Secretary of State, USA

- condition of being protected against undergoing or causing harm, injury or loss

So what is safety?

And.. what is innovation?

- Something new, original and more effective

So what is design?

- a process of developing purposeful and innovative solutions that embody functional and aesthetic demands

Joe Bourgraf,
President, Ferno Group

- “To create an innovative and model EMS system... we must engage in a collaborative and cross-functional conversation among the many contributing partners in the EMS industry. EMS suppliers should embrace and drive new innovation... to improve the process and efficiency of delivering service, while advancing the level and outcome of emergency care”
From low tech to high tech
- System of Safety
- Think of the overall impact
- Small low cost changes in practice
- Policies that augment safety
- Innovation in design from micro to macro
- Preparedness and Training

EMS Risk and Design needs
- Transport Medicine

New World Order

Covid19, the 2020 Pandemic

New Tragic Hazards for EMS
April 21, 2020
- Constable News: FDNY mourns death of EMT from COVID-19

May 1, 2020

April 22, 2020
- NYC EMT tells key story of coronavirus, becoming 3rd active FDNY member killed by pandemic

April 28, 2020
- > 24 Covid19 USA EMS Provider deaths

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
How does design happen in EMS

- Tradition
- Experience
- Vision
- Interdisciplinary

EMS Safety’s frontier -

- the interface of disruptive new tech and operational practice at all levels of the EMS system and across disciplines

Gartners Hype Cycle 2017

Gartners Hype Cycle 2019

Ambulance Transport Safety IS Complex AND Multidisciplinary

- Epidemiological Data Collection
- Biomechanical Automotive Safety
- Occupational Health
- Safety Technology
- Transportation
- Policy
- Management

Key elements to transport safety

- Impact Biomechanics
- Transport Ergonomics
- Fleet Safety
- And now so key…effective PPE….

Safety Dimensions we know

- Safe systems – CRM / transport system safety
- Risk perception
- Fleet and operations management
- Vehicle design safety
- Scene safety
- Patient Handling: physical & biological hazards
- Health and wellness
- Hours of service

TRB EMS Safety Summit

- TRB Transportation Research Board
- 1: Intro & 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
- Panel: How to optimize the safety of your existing fleet
- Wrap up – from Prof. Art Cooper

The 2012 TRB EMS Safety Summit

print this page & your smart phone will play the 8 sessions from the QR codes
Now we have many new technologies

- Fleet management tools
- Vehicle design
- Visibility
- Drones
- AR
- VR
- AI
- Digital Health
- The Cloud
- The Crowd

1980's Then….

And NOW!…

USA 1980's Then….

And 2019…

PREDICTABLE PREVENTABLE and NO ACCIDENT

So ambulance design technical science…. Not really a new issue

1864 Ambulance Design Patent re: safety of ambulance design > 150 years ago

If you were to survey for what would enhance safety and efficiency then….

- Likely “more rest stations”
- Not likely – “the combustion engine”

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
USA Absence of technical automotive safety performance standards and oversight

- Multiple different consensus, not technical vehicle standards
- Challenges in identifying best practice
- Myriad of unregulated commercial products
- No system safety performance standards
- Absent national safety oversight

NAEMSP 2012

Safety and Operational Innovation: Integrating Global Best Practice and Interdisciplinary Technical Expertise into Ambulance Design


January 27, 2020

FMCSA – Federal Motor Carrier Safety Administration

April 23, 2020

April 27, 2020
In the USA there are more safety standards for moving cattle than for moving patients.

The Laws of Physics Prevail.

Philosophiæ Naturalis Principia Mathematica, July 1687

In the absence of a data capture system for EMS safety performance, government estimates can underestimate the situation.

Of course medics are not wearing their seat belts...

Challenging design related Human Factors

Equipment hard to reach

Interior design exposes EMS to unnecessary automotive and ergonomic hazards

Safety in EMS is MULTIDISCIPLINARY:
- Clinical practice
- Public health
- Automotive safety
- Impact biomechanics
- Human factors
- Fleet safety

Enhancing Ambulance Operational Practice with a Systems Safety Approach

Nadine Levick, MD MPH
Research Director, EMS Safety Foundation
CEO, Objective Safety
New York, NY

Health Care Systems Rm 511-A
Safe Systems Approach

Vision Zero
A conscious decision to eliminate death and serious injuries

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

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

must be evidenced based

Science of Safety Design

The clever independent leg
Mondial stretcher

Testing the real world
Work Smarter NOT Harder

Learning from our international colleagues www.Rettmobil.com

The old expensive and not versatile and the new…
Rapidly and game changing technology and cheaper, better, very versatile

Some examples of Global Innovation

Fleet Mix ?

The Motorcycle Medics
Israeli Innovation

- MDA fleet
  - Mobile Advanced Life Support Units (MALSUs [Hebrew: "NATAN"])”
  - Advanced Life Support Ambulances (ALSAs [Hebrew: "ATAN"])”
  - Standard Ambulances
  - Mobile Mass Casualty Incident Units (MMCIUs [Hebrew: "TARAN"])”
  - Command and Control Vehicle
  - Ambulances equipped with 4 X 4 wheel drive
  - All Terrain Vehicle – Ambulance (ATV – Ambulance)
  - MDA - Helicopter, Segway
  - Advanced Life Support Motorcycles
  - Supervisor Vehicle.

Israel
Magen David Adom - MDA

- MDA App
  - Medical Hx & Video transmit capacity
  - MDA App with scene video connect to MDA Dispatch

Constant preparedness a reality

MDA Innovation
Eli Jaffe EMT-P, PhD – MDA Deputy Director General-Community & International Relations

Mass casualty drills & Eli Jaffe EMT-P, PhD’s moulage T-Shirts
New Models in the Corona Era

- 25-30% EMS runs are non-transport
- 30% of EMS transports to the ED are discharged home within 4 hours
- 24/7 national physician video interactive telemedicine support for these cohorts

EMS Triage… no.. Voting booth

A multicultural service

Innovative Fleet Funding

Malaysian Ambulances

- Modern automotive vans
- No disruption of vehicle integrity
- Clever and data-driven interior layout
- Structured system of policy
Clever innovation can be very simple, yet cost efficient

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

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

Configurable!

LED lights on the stretcher
Simple equation
- Strip of LED lights + small battery + switch = $20
- Can see where the stretcher is going at night
- Fewer tripping injuries, fewer dropped patients
Voice Activated

http://www.emssafetyfoundation.org/video/INDEMOredstrobe.mp4

Telematics
- How much technology and data and of what type do you need to improve fleet safety performance

Fleet telematics tools
- Fleet mix
  - Drones
  - Vertical take off vehicles
- Voice activated commands
- Mixed reality
- Advanced Smart phone technology
- Connected health
- Wireless patient monitoring
- Health Information Exchange (HIE) Applications

Next is now!
- Virtual Reality First Aid/EMS
  - Just released - Virtual Reality Scenarios that you can build, April 2020 – and with gratis Covid19
  - https://www.VRpatients.com
  - Real First Aid, First Aid and MCI VR both physical simulation scenarios Jan 2018
  - Haseeb Iqbal, Published on Jan 27, 2018
    - Virtual Reality CPR created for the Oculus Rift using Unreal Engine 4. Integrated with Leap Motion technology
    - https://www.youtube.com/watch?v=Vq7k-Kg7ulo
  - IRC ircouncil, Published on Oct 10, 2017
    - Project by Italian Resuscitation Council
    - Scientific Supervision: Federico Semeraro, Andrea Scapigliati & Giuseppe Ristagno
    - VR development: Studio Evil s.r.l.
    - https://www.youtube.com/watch?v=reSpd1hrVXQ
  - ResusCouncilUK, Published on Sep 8, 2017
    - A virtual reality game-in-a-film that teaches you to save a life. Step inside, save a life.
    - https://www.youtube.com/watch?v=QuUavS3WSAI
  - Virtual Education Systems, Published on May 16, 2017
    - This video is showcasing the abilities of VRPatients.
    - https://www.youtube.com/watch?v=K_hFS7Cocfg
    - https://virtualeducationsystems.com/
  - Marco Vettorello, Published on Sep 3, 2017
    - First test of teaching defibrillation (AED) with the HTC Vive in a homemade Unity scenario
    - https://www.youtube.com/watch?v=pMPtIzzd9xw

Virtual Reality First Aid/EMS
- Next is now!
  - Virtual Reality Patients – EMS
    - www.VRpatients.com
VR – CPR training
http://dualgoodhealth.com/info/

VR EMS violence training

- Ambulance Victoria, Feb 2017, Virtual Reality training for all Ambulance Victoria paramedics to better protect them from violence as they respond to medical emergencies.
- Ambulance Victoria is using Virtual Reality to help paramedics manage violence and aggression in the workplace.
  www.globalfrontline.com.au
  https://www.youtube.com/watch?v=IiQbarF5tvFA

VR MCI - RealResponse.com.au

Performance score card
Virtual Reality
A new design tool too
Exploring the inside of a virtual ambulance
Cardiac Arrest.... Engage bystanders!

Unmanned Ambulance drones

Manned Drones

eHang passenger drone

? The ambulance of the future

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

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

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

Conclusion

1) Safety must be inherent to operational process design and practice
2) Engagement of appropriate interdisciplinary expertise in systems design, transport safety human factors 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.
Your electronic handout/resource link with all text slides

http://www.objectivesafety.net
Your Handout and Additional Resources

On if you are > 45 years