Safety Concern as a Priority in EMS
The Cutting Edge and You!

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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.

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.

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

Autonomous vehicles and drones

1980’s Then….
And NOW!…
USA 1980's Then….

And 2018…

the EMS transport process

- communications/dispatch
- the patient
- restraining device/seat
- transporting device/journey
- paramedic/transport nurse, doctors & family
- patient monitoring equipment
- clinical care & interventions
- protective equipment
- the vehicle
- the driver/driving skill
- other road users
- the road

The Emergency Department (ED)

An ambulance is not an ED /ICU on wheels

Core aspects

- Ambulance transport safety “is part of a system”
- Patient safety…and provider and public safety tool
- New developments and safety initiatives
- Need for measurement for safer performance
- Creating a ‘culture of safety’ thru awareness, training, design, technology and incentive.

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

Yet….

- In less than 3% of transports is it a life threatening emergency

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

‘Workplace’ Hazards

Safety Dimensions

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

EMS Safety Foundation Leadership Award presented to Khalifa AlDarri - March 21, 2017

EMS Safety Foundation Innovation and Practice Award, DIAC - March 6, 2018

Work Smarter NOT Harder
What safety approaches you can do today!!

- Secure all your equipment
- Avoid speed and risky driving practice
- Wear your seat belts, and notify driver if out of your belt
- Use LED lights on the stretcher

What you can plan for tomorrow

- Safe vehicle operations policies
- Fleet management tools
- Optimized vehicle design
- Forward and rear facing seating
- High visibility protective clothing
- Fatigue/Hours of service
- Head protection
- Patient handling safety guidelines and tools

The near future

- AI
- VR
- AR
- Drones

Innovation

- Collaboration
- Knowledge transfer

Gartners Hype cycle 2013

Gartners Hype cycle 2017

You're also going to hear about

- Voice activated commands
- Drones
- Vertical take off vehicles
- Fleet mix
- Smart phone technology
- Wireless patient monitoring
- Connected health
- Health Information Exchange (HIE) Applications
- Virtual reality
- Artificial intelligence

Goals

- Standards for safety
- Policy based on Science
- Databases to demonstrate outcome

Safety of the...

- Provider
- Public
- Patient
Safety is a tool to save
- Lives
- Time
- Money

must be evidenced based

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

Leading Change

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

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

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

EMS work environment!!

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……

USA EMS transport safety data estimates
- Includes police report data and estimates based on known data capture deficiencies
- ~ 81,000 vehicles
- upto 9,000 crashes a year
- One fatality each week
- ~2/3 pedestrians or occupants of other car
- ~10 serious injuries each day
- >50% not ambulance occupants
- Cost estimates > $500 million annually

In the USA there are more safety standards for moving cattle than for moving patients.

This vehicle is safety crash tested by automotive experts.

Unlike this vehicle.

Safety is Good Business

Safety in EMS is INTERDISCIPLINARY
  clinical practice
  public health
  automotive safety
  impact biomechanics
  human factors
  fleet safety

Ambulance Transport Safety IS Complex AND Multidisciplinary

Dispatching a vehicle

Getting you, your patient and equipment to, in and out of the vehicle

Occupant protection in crash and near miss situations

Public safety

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

Transport Medicine
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
  So...
- Clinical need
- Human tolerance of injury

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?

<25 mph - A survivable impact??

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

What is a survivable impact?
\[ E = \frac{1}{2} m v^2 \]
\[ v^2 = 2as \]

~ 30 mph - survivable

What is a survivable impact?

~ 60 mph – not survivable

A survivable impact??
A serious problem…

Firstly!

- An accident?
- or a predictable and preventable event

Testing the real world

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

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

A harness is NOT a solution
it will just break your neck at speeds that you would otherwise not have an injury

NOT new technical data...

Beware some provider restraint systems are dangerous

Being seated IN an automotive seat is what will protect you
- Anything that allows or encourages you to get up out of your seat will also encourage you to be injured or killed – it is potentially lethal to be out of your seat in any fashion
- 4 or 5 point harnesses over both shoulders for side-facing occupants are potentially lethal – and in NO WAY SUPPORTED BY ANY DATA OR INDEPENDENT AUTOMOTIVE SAFETY EXPERTISE

Transport Medicine

A tragic emergency health care intervention outcome

It does happen....
But what about head protection?

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

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


Clever innovation can be very simple, yet cost efficient

Malaysian Ambulances

- Modern automotive vans
- No disruption of vehicle integrity
- Clever and data driven interior layout
- Structured system of policy
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

High visibility clothing - retroreflective

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

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
Telepresence Robot

- An iPad on mini segway 'legs' which can be self-driven from a cloud-based platform from anywhere globally was utilized to share the INDEMO design features beyond its physical location.

DCAS - Engaging youth!

Virtual Reality training tools
The solution

- Optimized design of ambulances so you can reach your patient and equipment without getting out of your seat
  - Forward and rear facing seating
  - Patient shoulder straps
  - A laterally sliding stretcher platform
  - Equipment stored on the curbside wall

The top three safety and design advances

- In-vehicle Fleet telematics and warning systems
- OEM vehicles with ESC and crashworthiness and forward and rear facing seating only AND
- Laterally moving stretcher platforms

2020 Transport

Intelligent Transport Safety Systems

Regional connected/autonomous vehicle challenges

Wearable tech..

Soterawireless & Intel’s Eric Dishman

http://www.visimobile.com/visi-product-info/
Clever fleet management tools

Telematicus

GPS and GPRS status

A smart phone App that is a safety tool

Fleet Management capability

Vehicle database
- Individual vehicle data
- Fleet mileage collection
- Link to other systems

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

Reporting
- Export to Excel for manipulation
- Scorecards views, Crystal Reports

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AI and EMS Dispatch

Cardiac Arrest.... Engage bystanders!

www.iRescU.info
Community Engagement - Crowdsourcing

The ambulance response vehicle of the future?

And even now AED Drones!

Unmanned Ambulance drones

January 18, 2018

D Moto

Drone saves two Australian swimmers in world first

Manned Drones
eHang passenger drone

? The ambulance of the future
First passenger drone makes its debut at CES

Urban Aeronautics – vertical take off drone

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1) Safety must be inherent to operational process design
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.

**Conclusion**

**Your electronic handout/resource link with all text slides**

www.objectivesafety.net/PDFHO.htm

**http://www.objectivesafety.net**

Your Handout and Additional Resources

Or if you are > 45 years

www.objectivesafety.net/PDFHO.htm