

27^e Congrès scientifique de médecine d'urgence
Centre des congrès de Québec
17 au 18 novembre 2010

November 18, 2010, Quebec, Canada

EMS - How fast and how safe

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CEO, Objective Safety
New York, USA

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Who am I?

- ▶ Nadine Levick MD, MPH
- ▶ Emergency Medicine Physician and Public Health Academic, (USA-Hopkins, Harlem, Maimonides, Brookdale & 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

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- www.objectivesafety.net

This WILL be FAST!!
No need to take any notes – all text slides will be awaiting you in your online Handout

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

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Where am I really from? ...Yes, it IS that big!

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Jump start
A BoboBox Series II kangaroo tests dummy is used in New South Wales, Australia, to help automobile designers study a unique Australian road safety issue – traffic accidents with kangaroos.

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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

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And....

- Le participant comprendra mieux l'enjeu entre le temps de réponse préhospitalier et la sécurité routière par l'organisation de systèmes préhospitaliers

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Patient Safety UK- A routine concept...

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But Patient Safety is just one part of this system

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Safety of the...

- Provider
- Public
- Patient

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And..

- In the vehicle
- At the scene
- During transport

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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

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Balance of concerns and risk during transport

- Response and transport time
- Clinical care provision
- Occupant safety/protection
- Public Safety

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Firstly!

- An accident ?
- or a predictable and preventable event

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A tragic emergency health care intervention outcome

Rollover Crash Kills Medical Technician

It does happen....

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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

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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.....

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Creating a Safety Culture

within a company must have leadership and support of upper management **safety**

- Awareness
- Training
- Incentive

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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?

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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

TIME
&
PLACE

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The Emergency Department (ED)



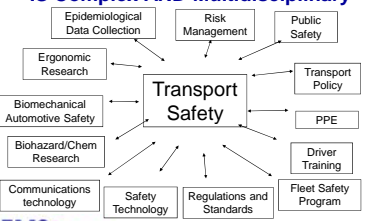
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An ambulance is not an ED /ICU on wheels




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Ground Ambulance Transport Safety IS Complex AND Multidisciplinary



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Do we ask vehicle builders to write cardiac arrest protocols...? Vehicle design and safety is not what we are trained to do!!!!



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Would we....?

Seeing that we are health care providers – lets look at it this way –

- Would we use medical equipment that was built by folks who were not technically qualified or trained biomedical engineers and who just said – “this device is safe”?
- Or would we expect them to be qualified in this field and that their products were tested in a meaningful way to ensure that they were safe?



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

Ontario EMS Occupant Safety 30 August 2010

Ontario Emergency Medical Services Section 21 Sub-Committee
Emergency Medical Services Guidelines Team 02
June, EMS Safety Program 2010

Ontario Emergency Medical Services Section 21 Sub-Committee

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November 11, 2010

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November 11, 2010
Nurse sues W. Va EMS agency after ambulance crash

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Predictable risks

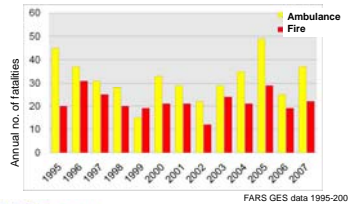
- Fatal crashes more often at intersections, & with another vehicle (p < 0.001)*
- 70% of fatal crashes EMS crashes during Emergency Use*
- Most serious & fatal injuries occurred in rear (OR 2.7 vs front) & to improperly restrained occupants (OR 2.5 vs restrained)**
- 82% of fatally injured EMS rear 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, Pirralo RG, Kahn EM. *Prehosp Emerg Care* 2001 Jul-Sep;5(3):261-9
**Baker, Zaslavsky, Levin, Li, Miller. *Acc Anal Prev* 2003
***Maguire, Harrop, Smith, Lewis. *Annals Emerg Med* Dec 2002
#RACDH, 2003
##Way AM, Kupka CF. *Prehosp Emerg Care* 2005 Dec; 9:412-415

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

USA Emergency Vehicles Minimum Annual Fatalities 1995-2007



FARS – A National Data Set?

Small numbers – but NO data captured from 20% of the nation in 10 years

Total Fatalities Per 100 Million Population 1996-2006



Denominator?

- # vehicles
- # types of vehicles
- # runs
- # miles/kms
- Nature of patient
- Severity of patient

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Moose crash data...? – not EMS crash data

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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
 - 100 km rural road length
 - 1000 km² area
- # Staff/
 # EMS Transportation Units/
 - 10,000 citizens
 - 100 km rural road length
 - 1000 km² area
- EMS response times/

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Occupational transportation fatalities..

Category	Fatalities/100,000 workers
EMS	~10
Police	~5
Fire	~4

- WE HAVE A BIG PROBLEM HERE

* Maquire, Hunting, Smith & Levick, Occupational Fatalities in Emergency Medical Services: A Hidden Crisis, Annals of Emergency Medicine, Dec 2002

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

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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

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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

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Current accepted safety design and transport system technologies are being ignored, and worse...

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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

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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.
- Vehicles equipped with ESC are involved in fewer severe collisions caused by loss of control, resulting in significantly fewer deaths and injuries

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So

- What's important
- What's not important

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

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

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- What is factual
- What is garbage

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- What is new
- What is not new

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Some new dimensions

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

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



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Systems safety of:

- Selecting, dispatching and managing your fleet
- 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

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Safety Performance

- Measurement
- Outcomes
- Technical expertise

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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?

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

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What is a survivable impact ?



12 mph (20 km/hr)?



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What is a survivable impact?

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



~ 30 mph - survivable



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What is a survivable impact?

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

$$v^2 = 2as$$



~ 60 mph – not survivable



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A survivable impact??



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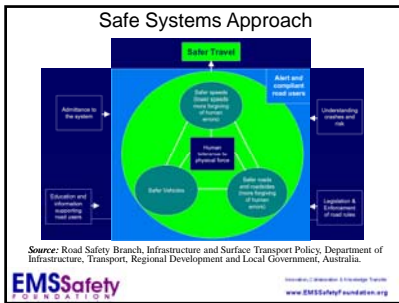
A serious problem...

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

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- ### Key Elements to Safety
- Data Capture
 - Vehicle Biomechanics and Crashworthiness
 - Ergonomics and Biohazards
 - Transportation Environment
 - Safety Management – evaluation and analysis

Transport Medicine

- 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

April 14th, 2008

Ambulance worker loses arm in accident - West Nyack, New York

An emergency service worker lost her right arm today after the ambulance in which she was a passenger crashed into a truck parked along Route 59 near the River to the Palisades Center mall.

Bonnie Ames, 25, was taken by helicopter to the Westchester Medical Center in Valhalla where she underwent surgery.

"She's out of danger, but she lost her arm," Raymond Florida, director of Richard Paramedic Services said early this evening.

"We used multiple units from the jaws of life to extricate her," West Nyack Fire Chief George Drescher said. "She appeared to be seriously injured."

The paramedic van driver, 59-year-old Scott, was taken to Westchester Medical Center, said

Under age 25 years you are more likely to crash anything - including an ambulance...

Paul Fong and Thomas T. Tappan / JGIM

The Relationship Between Ambulance Crashes and Emergency Medical Technicians' Age

Jonathan S. Stohler and Edith Posner
The Johns Hopkins University School of Medicine, Baltimore, MD, and the Johns Hopkins Hospital, Baltimore, MD

ABSTRACT

Objective: Ambulance crashes have been increasing in frequency. Older EMTs and paramedics provide excellent service for most of ambulance crashes. However, data on the impact of younger EMTs on ambulance crashes are limited. The study authors determined which emergency medical technicians (EMTs) were at highest risk of involvement in ambulance crashes.

Conclusions: When controlling for call volume and ambulance time, the odds of having been in an ambulance accident within the past year were significantly higher for younger EMTs. Future studies should investigate the effects of various interventions such as increased field supervision or driver safety training programs on the driving performance of younger EMTs.

We should use the best safety practices demonstrated in engineering

Development of an Effective Ambulance Patient Restraint

Development and Application of a Dynamic Testing Procedure for Ambulance Poediatric Patient Restraint Systems

Biomechanics of the patient compartment of ambulance vehicles under crash conditions: testing countermeasures to mitigate injury

2001-01-1173

John Yarnes

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...in automotive safety engineering

CRASHOVERLAP ANALYSIS OF FREE-PIVOTING AMBULANCE SEATBELT

DEVELOPMENT OF PROPOSED CRASH TEST PROCEDURES FOR AMBULANCE SEATBELT

VEHICLE CRASHOVERLAP FRONTAL IMPACT TESTING

Ambulance Vehicle Crashtestability and Passive Safety Design: A Comparative Evaluation

2008-01-002

Walter J. Rut

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and in ergonomics

Ergonomics in the rescue service—Ergonomic evaluation of ambulance seats

Reviewing ambulance design for clinical efficiency and paramedic safety

2007-01-008

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Golden Hour – not so hot

March 2010
Annals EM

Emergency Medical Services Turnover and Survival in Trauma Assessment of the "Golden Hour" in a North American Trauma Center

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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.]

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Is response time really a meaningful measure of patient outcome??

- What are the confidence limits?
- What about demographics, population density?

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April 2010, Resuscitation – Going fast can hurt your patient clinically!

Effect of vehicle speed on the quality of closed-chest compression during ambulance transport

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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

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Science behind Policy

- "For successful technology, reality must take precedence over public relations, for Nature cannot be fooled."

Richard P. Feynman 1988

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Policy makes a difference...

Organizational policy and other factors associated with emergency medical technicians' work habits

Jonathan R. Stueck, Amy Farkisch

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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."

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Safety is Good Business

Federal Motor Vehicle Safety Administration

Safety is Good Business - Crashes Hurt Your Bottom Line

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A 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

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Very Expensive

AN ALAMEDA COUNTY, CALIFORNIA, JURY ORDERED AMERICAN MEDICAL RESPONSE (AMR) to pay nearly \$24 million damages to a man who was permanently paralyzed after a traffic accident involving one of their ambulances.

On April 14, 2007, Louis Del Barba, 85, was driving his auto and making a turn when he was broadsided by the ambulance. The ambulance's speed was measured at 45 mph in a 25 mph zone. Experts agreed that such a speed, in rush hour conditions, was reckless and unsafe.

A press statement released yesterday by the plaintiff's lawyers stated:

Mr. Del Barba had the right of way and was wearing a shoulder and lap seat belt when the crash occurred. As a result of the accident, he received numerous traumatic injuries and is paralyzed completely, same for some movement of his head and left arm. He is completely dependent on a ventilator. Doctors believe that he can return to his 110-year-old family home if there are funds to fit a room for medical care. The jury felt strongly that Mr.

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

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Safety saves time, lives AND money Canada, Nova Scotia

- Since 2000 working towards a goal of zero loss ratio with insurance provider
- 10 million kilometers per year
- 150 emergency response ambulance units
- Collision claim history measured in dollars per 100,000 kilometers traveled:
 - 2000/2001 \$ 1725.00
 - 2001/2002 \$ 1049.00
 - 2002/2003 \$ 751.00
 - 2003/2004 \$ 416.00
 - 2004/2005 \$ 229.00

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Ambulance accidents down

System put in place | Ambulance NB says safety program works

Ambulance NB says two recent accidents involving its paramedics were unfortunate, but a system-wide vehicle safety program has statistically reduced collisions over the past two years.

Statistics provided by The Daily Observer show that the provincial ambulance service was involved in a total of 88 collisions and crashes in 2008.

That number declined to 62 accidents in 2009.

Daphne Cormier-Labrecq, external communications officer for Ambulance NB, said the company introduced a comprehensive vehicle safety program in April 2008 and noticed results immediately.

"The total reduction in collisions from 2008 to 2009 is 23 per cent," she said.

"While not a reduction in major collisions of 50 per cent - that means vehicles that are out of service as a result of a collision."

The program consists of 62 sections, including components that cover both theory and practical skills.

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And very Predictable...

- Intersections are lethal environments

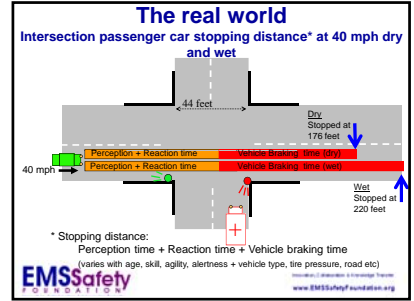
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So.. The real world for an EMS vehicle approaching a red light

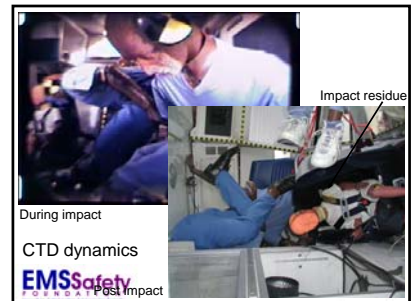
- You think they heard you...
- You know they must have seen you..
- And maybe they did
- But..
- There is NO way humanly possible that they could stop.....

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

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A few key words about restraint systems...



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



Levick NR, et al. Development and Application of a Dynamic Testing Procedure for Ambulance Pediatric Restraint Systems, SAE Australasia 1998;58:2:45-51





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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




Illustration © International Knowledge Transfer
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NOT new technical data...



Richardson S.A., et al. Int. J. of Crash., 4:3, 239 – 259, 1999

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



Illustration © International Knowledge Transfer
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Side facing 4-point harnesses demonstrated to be lethal, even at slow ground vehicle speeds




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'Workplace' Hazards




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

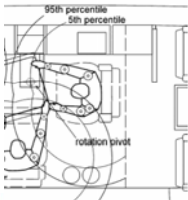




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Bigger is not necessarily better.....




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Rollover Crash Kills Medical Technician



It does happen....



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But what about head protection?

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New EMS helmet prototypes

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Tort Claims from Adverse Events in Emergency Medical Services

- Patient handling errors and emergency vehicle movement/collisions are the most common adverse events resulting in tort claims against EMS.

Henny E. Wang, Rollin J. Fairbanks, Manish N. Shah, Donald M. Yealy, University of Pittsburgh, Pittsburgh, Pennsylvania, Jan 2007

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The science of Stretcher lifting & loading

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Measure	Unit	Value
Height	cm	177.0
Weight	kg	75.2
Arm Length	cm	68.0
Leg Length	cm	93.0

Univ. of Michigan's 3DSSPP 4.21 - Copy Male 50th Nite Stretcher Low Lift.tsk - [Analysis Sum]

Description: Concept Risk Injury Management Services, Analyst: Unknown, Date: 10/29/09
Task: Unfiled Task
Gender: Male, Percentile: 50th, Height: 177.0 Cm, Weight: 75.2 Kg
Comment:

Force(N)	Left	X	Y	Z	Mag	Right	X	Y	Z	Mag
	0.0	0.0	-332.0		332.0	0.0	0.0	-332.0		332.0

L5/S1 Disc Compression(N) 5864 +/- 420

Percent of Population Capable	SCCL>1	T-COUL	Feet
Elbow:	99	% Load Left: 50	Right: 50
Shoulder:	96	SDL	
Torso:	70	SDL	% Balance: Acceptable
Hip:	66	SDL	CS Balance: False
Knee:	99		
Ankle:	99		Cost of Factors: 0

3DSSPP4.21, Copyright 2000, The Regents of the University of Michigan, ALL RIGHTS RESERVED

So whats important..

- A stretcher system that doesn't harm your back... or your services wallet
- 27 inch loading height

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And what is the loading height of your ambulance??

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Size matters.... Less than 27 inches will save your back!!!!

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Air EMS is a role model for safety initiatives and focus

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Air Safety Approach

- Safety Program Planning
- Evaluating
- Analysis of Safety Performance
- Analysis of Safety Information and Data
- Analysis of Risk Profiles and Plans

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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

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Rash of "Safety Concept" vehicles..... Devoid of substantive automotive safety engineering input or testing

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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

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Which of these two vehicles would you want? Sprinter v Ford Transit crash test

<http://www.youtube.com/watch?v=C3kN6WFSvAA&feature=related>

Sprinter V Transit Crash Test

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Ambulance Vehicle Standards??

- KKK?
- AMD?
- FMVSS?
- CMVSS?
- NFPA?
- SAE...?
- ASTM...?
- International
 - ASA
 - CEN

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Global EMS Vehicle Safety Standards v Specifications and Guidelines

- EMS Safety and Performance Standards
 - Australia & New Zealand 4535
 - 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 (devel)
 - Guideline: EMSC Dos and Dents, and (ASTNA, CAAS and CAMTS)

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October 2008 JEMS Article "Rig Safety - 911"

What you need to know about ambulance safety standards

Rig Safety 9-1-1

Why you need to know about ambulance safety standards

http://www.objectivesafety.net/JEMSRigSafety911.pdf

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Ridiculous current 2010 USA ambulance 'safety testing' !?!? - Is NOT consistent with accepted automotive safety practice...

AMBULANCE TEST RECORD BROKEN

38,000 lbs on ROOF

55,000 lbs on ROOF

55,000 lbs on SIDE

THAT WAS THEN

THIS IS NOW...

In 2000, shattered industry records by testing and certifying the modular body to more than double the 150% curb weight Federal Standard. In addition, they performed a body side test that had never been seen before. None has broken that record with a 55,000 body test on the top and side of the module. The ambulance body is now certified to a 500% curb weight level!

INDUSTRY LEADING SAFETY INNOVATION

No 'a'... then NO 'F' !!!!!

- F = ma

where F = force
m = mass
a = acceleration

Sir Isaac Newton (1642-1727), Philosophiæ Naturalis Principia Mathematica (Mathematical Principles of Natural Philosophy), published in 1687. http://en.wikipedia.org/wiki/Newton's_laws_of_motion

Yes a "nationally recognized testing lab" - BUT - NOT an automotive/occupant safety crash test lab!!

METALS & MATERIALS ENGINEERS

RESOLUTION IN ACTION

An SBA 8(a) Certified Company

SEARCH SERVICES: QUALITY SERVICES: CONSULTING/PROJECT MANAGEMENT: EMPLOYMENT: TRADE SHOWS: 2004-07-10

Engineering Services: 1886 Services: Construction Management:

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May 2010

SAE International SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J2917 MAY2010

Issued 2010-05

Original Intent and Equipment Mounting Integrity - Frontal Impact System-Level Ambulance Patient Compartment

NATIONALE

Not applicable

1. SCOPE

This SAE Recommended Practice describes the test procedures for conducting frontal impact occupant restraint and equipment mounting integrity tests for ambulance patient compartment applications. Its purpose is to describe crash pulse characteristics and establish recommended test procedures that all standard restraint system and equipment mounting testing for ambulances. Descriptions of the test set-up, test instrumentation, photographic/video coverage, and the test failures are included.

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

NATIONAL TRANSPORTATION SAFETY BOARD WASHINGTON, D.C.

18889, 189 17, 2008

The interior of the ambulance body was severely damaged. The flooring, oxygen bottles, litter, cabinets, and bench were either destroyed or ejected from the ambulance. Because the forward flooring was not secured to the floor or chassis, everything attached to or resting on it came loose when the ambulance rolled over. All body structures were deformed downward and to the right.

A review of the Federal Motor Vehicle Safety Standards (FMVSS) revealed that there was no standard or specification which covers the total design and construction of ambulances as modified by the manufacturer. The review also identified significant design and safety deficiencies in the design of ambulances as modified by the manufacturer. The review also identified significant deficiencies in the design of ambulances as modified by the manufacturer. The review also identified significant deficiencies in the design of ambulances as modified by the manufacturer.

There are no performance requirements for the aforementioned modifications to vehicle structural integrity, equipment location, equipment mounting, and the protection of items such as litters, benches, cabinets, oxygen bottles, or flooring. The only guidance concerning these safety

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American National Standard ANSI/ASSE Z15.1-2006 Safe Practices for Fleet Motor Vehicle Operations

Z15 COMMITTEE

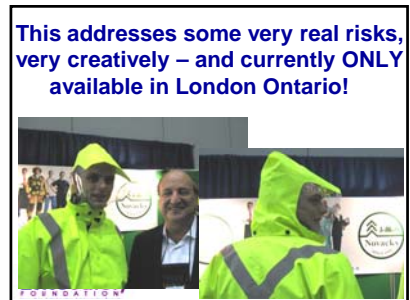
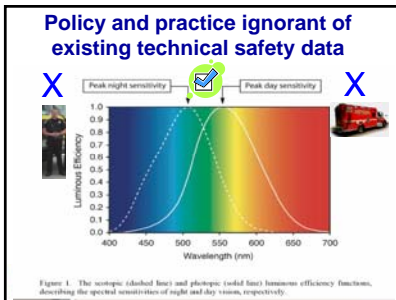
AMERICAN NATIONAL STANDARDS

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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

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- Emergency Vehicles – Viewer Awareness
- For a timely, appropriate and safe response
- Location
 - Size
 - Shape
 - Speed
 - Intended path
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- Having access to that technical knowledge supports changes to improve safety practice

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Muskoka EMS - Canada

Old design



New design



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Muskoka EMS - Canada



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



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Innovation

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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

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Transport performance

- Driver training?
- Real time safety performance outcomes?

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What about changing driver behavior in the real world??

AN OPTIMAL SOLUTION FOR ENHANCING AMBULANCE SAFETY: IMPLEMENTING A DRIVER PERFORMANCE FEEDBACK AND MONITORING DEVICE IN GROUND EMERGENCY MEDICAL SERVICE VEHICLES

Nadine R. Levis, MD, MPH
Maimonides Medical Center

REAL WORLD APPLICATION OF AN AFTERMARKET DRIVER/HUMAN FACTORS REAL TIME AUDITORY MONITORING AND FEEDBACK DEVICE: AN EMERGENCY SERVICE PERSPECTIVE

Nadine Levis
Objective Safety LLC
United States of America
Larry Wyruch
Michael E. Nagel
California, Australia
United States of America
Paper Number 15/0224
F O R E N S I C

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Invehicle technologies to enhance transport safety

- Aftermarket in vehicle electronic e-safety devices with monitoring and feedback

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Its out there NOW

- 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



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The EMS Safety Foundation: A practical and functional model

Interdisciplinary and Operational and International

- Innovation
- Collaboration
- Knowledge transfer



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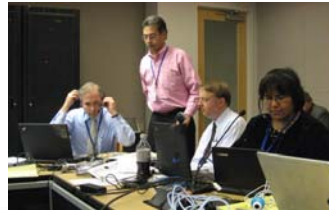
R & D “Ripoff and Duplicate”

- Avoid reinventing the wheel at all costs
- Where are the best practices that we need to transfer knowledge from



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Automotive engineers addressing EMS Safety Foundation Workshop



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International approaches

- The state of the art non-USA vehicles have NO squad bench nor the after market structural vehicle modifications that can potentially decrease crashworthiness integrity that were seen in study vehicles.



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EMS Safety Foundation Delegation seeking out International Innovation



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Vehicle Occupant Safety design

European design
Safety technology
is a key focus



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Safe and Ergonomic design



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Flexibility to manage two patients



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Texas - Careflite's new vehicle



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Careflite's new vehicle



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Manitoba's new fleet



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EMSSAFETY JOURNAL

Local News

IRHA selected to test new ambulance
New design smaller, more cost efficient, say health officials

Manitoba Health is looking to act on its original plan by implementing a pilot project, giving the RHA's a year to evaluate the Sprinter design to see if it could be a replacement to the current Fleet Mac ambulance design.

According to Christenson, the Sprinter design looks similar to delivery vans, and boasts a whole new set of safety and technology features such as GPS.

It's a lot smaller, so that makes it a lot easier for paramedics to be strapped in but still be able to reach all the equipment needed to tend to a patient," said Christenson.

Christenson also explained that the new ambulances require less maintenance, and have an overall smoother ride. They also are lower to the ground and come equipped with new "no-lift" stretchers, that eliminate 85 per cent of strenuous lifting paramedics do to get patients in and out of the vehicle.

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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

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Transportation Research Board is an excellent resource... we should be using it!!



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this vehicle is safety crash tested by automotive experts



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Unlike this vehicle



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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?

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Fleet Mix ?



Were we safer in the Cadillac???



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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

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Risk/Hazards

- Predictable risks
- Predictable fatal injuries
- Serious occupational hazard
- Public safety hazards

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Goals

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

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Safety Management

- A Safety Culture
- Protective Policies
- Protective Devices
 - In the event of a crash
 - To prevent a crash
- Continuous Education and Evaluation

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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

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Future

- Meaningful Goals
- New policies
- New practices
- New standards
- New vehicles
- New technologies

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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

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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

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Thank you! Any Questions??

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



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