STAYING ALIVE IN THE FIELD
Ambulance Transport Safety: Everything You Really Need to Know

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

To quote Steve “Sid” Caesar –
Director IHS ES
“We want everyone to get home safely each day”

What we shall cover...
- Multimedia overview of safety statistics, demonstration of crash testing, and a review of what is on the horizon in ambulance safety development.
- An outline of strategies and new safety technologies to enhance occupant safety, highlight of important predictable and preventable occupant risks, and expose mythologies regarding safety practices and devices.

Things can go wrong – but if you are well trained and well prepared you can minimize harm

Creating a Safety Culture
within a company must start with upper management’s commitment to safety
- Awareness
- Training
- Incentive

Tragedy you don’t want to be involved in
- Dan Berry (1948-1998)

Canada - Safety Leaders
- The West
  - British Columbia
  - Alberta
  - Saskatchewan
- The East
  - Ontario
  - Quebec
  - New Brunswick
  - Nova Scotia
  - Prince Edward Island
  - Newfoundland
- The North
  - Yukon Territory
  - Northwest Territories
  - Nunavut
Dan E. Berry, P.ENG. (1948 - 1998)

Dan Berry graduated in mechanical engineering from Queen's University, Kingston, in 1972, embarking on a career in mining, transportation and EMS.

In 1990, Dan joined the Emergency Health Services Branch of the Ontario Ministry of Health.

In 1991 Dan initiated a series of projects to evaluate the handling, stability and crashworthiness of the province’s ambulance fleet with a view to improving the safety of patient transportation. This included:

- A series of frontal and lateral crash tests of van and modular ambulances conducted at the Transport Canada facilities in Blainville, Quebec.
- Further safety improvements as a result of analysis of the extensive information base of ambulance accident statistics, a program of user survey feedback and research of industry initiatives.

The ambulances now in operation in Ontario are a confirmation of the professionalism and innovative skills of Dan Berry.

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?

Where am I really from?

...Yes, it IS that big!

http://www.objectivesafety.net
Your work environment

A best practice model

C45 - A criminal offence to not act in a way that protects the worker

Canada - Corporate Manslaughter Corporate Homicide Act: 8th April, 2008

Firstly!

An accident?

or

a predictable and preventable event
A tragic emergency health care intervention outcome

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......

Ambulance Transport Safety
- Emergency care, public health, public safety, and patient transportation.
- Important Principle: Ambulance transport safety is part of a system, the overall balance of risk involves the safety of all occupants and the public
- All get home safely

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

In a nutshell
- Am here to try to save you Lives Time and Money

EMS Transport Safety
- 'patient safety'
- AND also
- 'provider' and 'public safety'

This is not acceptable
In the USA*
- ~ 5,000 crashes a year
- ~ One fatality each week
  - ~ 2/3 pedestrians or occupants of other car
  - Approximately 4 child fatalities per year
- ~10 serious injuries each day
- Cost estimates > $500 million annually
- USA crash fatality rate/capita 35x higher than in Australia

Occupational transportation fatalities...

EMS Injuries*

- Higher than the injury rate for any private industry published by DOL
- 34.6 injuries/100 full-time workers per year
- 1.5 x that of fire fighters
- 5.8 x that of health services personnel
- 7 x the national average


October 2008 JEMS Article “Rig Safety – 911”

National Academies TRB EMS/Medical Transport Safety Summit November 7, 2008
http://www.objectivesafety.net/TRBSummit2008.htm

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

2008 - Air EMS on the NTSB’s “Most Wanted List”, where is ground EMS??

A Simple Question….

Creating a Safety Culture
within a company must start with upper management’s commitment to safety

- Awareness
- Training
- Incentive
Safety - Why now?

- Operating optimally in a transportation environment that is largely devoid of specific safety standards for the hazards and risks present
- Bridge the gap between what technical information exists and what is accessible and applied to EMS

January 10, 2008

[Image of ambulance crash]

This is not a crashworthy environment

Jan 28th, 2008

[Image of ambulance crash]

Feb 21st, 2008

April 14th, 2008

April 20, 2008, ??
June 17th, 2008
A paramedic and a patient killed

In this vehicle...

October 31, 2008, Kentucky

Florida - January 12, 2009

The inevitable bottom line...

What do ambulance crashes really cost?
- Loss of life and injury
- Negative impact on EMS system
- Collisions are the largest liability cost and exceed malpractice or negligence
- Besides the direct financial costs of replacing a damaged ambulance and equipment, there are additional hidden costs incurred:
  - investigating the ambulance collision
  - negligence litigation/lawsuit
  - medical/disability costs of injured EMTs
  - hiring of new employees to replace injured personnel
  - retraining and psychological counseling of personnel involved and others
  - increased insurance rates

Expensive...

Very Expensive

June 2007

The Huntsville Times

Ambulance suit gets $3.1 million

$14 Million Judgement Against AMR

EMS Prevention

EMS Prevention
Very Scary insurance data

<table>
<thead>
<tr>
<th>Year</th>
<th>Payroll $1,000</th>
<th>Modified</th>
<th>Problem</th>
<th>Incurring</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>14.1</td>
<td>880</td>
<td>880</td>
<td>9,925</td>
<td>93</td>
</tr>
<tr>
<td>2002</td>
<td>13.0</td>
<td>847</td>
<td>847</td>
<td>2,550</td>
<td>12</td>
</tr>
<tr>
<td>2001</td>
<td>11.9</td>
<td>864</td>
<td>864</td>
<td>1,280</td>
<td>15</td>
</tr>
<tr>
<td>2000</td>
<td>10.8</td>
<td>826</td>
<td>826</td>
<td>194</td>
<td>9</td>
</tr>
<tr>
<td>2000</td>
<td>10.9</td>
<td>1,016</td>
<td>1,016</td>
<td>117</td>
<td>96</td>
</tr>
<tr>
<td>1999</td>
<td>10.8</td>
<td>1,011</td>
<td>1,011</td>
<td>30</td>
<td>11</td>
</tr>
</tbody>
</table>

Workers Compensation Rate increased by 26.5% Was $5.86/100 payroll in 2005-2006 Now it is $7.41 for 2006-2007

A problem

USA 2007 Insurance data –

» 27 fold more likely to have a claim based on transport than related to medical care

Accident Cost Table

<table>
<thead>
<tr>
<th>Year</th>
<th>Payroll $1,000</th>
<th>Modified</th>
<th>Problem</th>
<th>Incurring</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>14.1</td>
<td>880</td>
<td>880</td>
<td>9,925</td>
<td>93</td>
</tr>
<tr>
<td>2002</td>
<td>13.0</td>
<td>847</td>
<td>847</td>
<td>2,550</td>
<td>12</td>
</tr>
<tr>
<td>2001</td>
<td>11.9</td>
<td>864</td>
<td>864</td>
<td>1,280</td>
<td>15</td>
</tr>
<tr>
<td>2000</td>
<td>10.8</td>
<td>826</td>
<td>826</td>
<td>194</td>
<td>9</td>
</tr>
<tr>
<td>2000</td>
<td>10.9</td>
<td>1,016</td>
<td>1,016</td>
<td>117</td>
<td>96</td>
</tr>
<tr>
<td>1999</td>
<td>10.8</td>
<td>1,011</td>
<td>1,011</td>
<td>30</td>
<td>11</td>
</tr>
</tbody>
</table>

... Nov 8th's Fatality

Putnam Co. paramedic dies in ambulance crash

And Nov 10th's 2007 obituary....

Thursday July 5th 2007...

Paramedic Allan Parson's killed

"...I'd like to know what can be done so this never happens again...."

2 weeks later... Friday July 20th 2007

The worst ambulance crash in USA history

Five Killed in Crash of Ambulance and Semi

"...I'd like to know what can be done so this never happens again...."

"Almost the address says, 'They were doing what they should.'"

Emergency personnel throughout the region are also shocked and surprised that no one was killed, despite the fact that the crash occurred on a major highway at a very fast speed. "They were doing what they should," said Paramedic Allan Parson.

"They were doing what they should," said Paramedic Allan Parson. "They were doing what they should."
Charged with Vehicular Homicide

February 26, 2009 - Sentenced

Fatals and Funerals

USA EMS

- EMS Systems - >15,000
- Personnel - ~1 million
  (~30% F/T professional & 70% volunteer)
- Vehicles - ~50,000
  (Type I, Type II, Type III, Freightliners, ?motorcycles)
- Transports - ~50 million
  (to Emergency Depots - 50% < 1/3 emergent)
- Cost - ~$5 Billion annually
- Safety Oversight - ? Disparate

Canada EMS

- EMS Systems - ? in each province
- Personnel - ~72,000
  (~70% F/T professional & 10% volunteer)
- Vehicles - ~72,000
  (Type I, Type II, Freightliners, ?motorcycles)
- Transports - ~72 million
  (to Emergency Depots - 100% > 1/3 emergent)
- Cost - ~$500 million annually
- Safety Oversight - ? Disparate

This IS a Transportation and Automotive Safety issue
Key Issues

- Mythology
  - That Emergency Medical Service personnel are safe
- Injury Hazards
  - Disease
  - Chemical/Radiation
  - Physical/Mechanical trauma - THE BIG PROBLEM
- Motor Vehicle Crashes are the highest cause of death at work - EMS has > 2X the mean national rate in USA

An R & D and Regulatory Gap
- Automotive Health and Safety
  - "the workplace is in a vehicle" - extensive data are absent
- Automotive Safety
  - a vehicle is the work place - "exempt" from automotive research environments

New Information 2006-2009
- Enhanced Safety of Vehicles (ESV), June 2007
- American Society Safety Engineers (ASSE), June 2006 & June 2007
- International Ergonomists Association (IEA), June 2006
- Transportation Research Board - EMS Safety address, Jan 2007
- NHTSA, August 2007
- OSHA September 11, 2007 Federal Register
- SAFTEL 2006
- NHTSA, September
- Younker, "Facilita, Efficient Transportation- Equity Act: A Critical Comparison
- State Strategic Highway Safety Plans, October 2007
- State EMS Council Policies 2007-2008
- APHA, Nov 2007
- OSHA Environment, late 2008
- Transportation Research Board - Inaugural EMS Safety Subcommittee meeting Jan 2008
- Worker visibility Act, implemented, Nov 2008
- TRB Inaugural Ambulance Transport Safety Summit, Nov 2008
- TRB Summit for October 2009

Key Elements to Safety

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

Benefit of Safety

- Any cost of addressing these issues is dwarfed in contrast to the huge burden of not doing so - in financial costs let alone the personal, societal, ethical and litigation costs

Some odd 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

Some recent adverse outcomes

- UPS and Laundry trucks have very similar design and even more stringent safety requirements to EMS vehicles BUT very different cargo......
- People are passengers and NOT packages or parcels

Testing the real world
Unique workplace
- In vehicles
- At roadside and other emergency scenes

The ‘workplace’ IS a vehicle
- EMT’s often in vulnerable positions during transport.
  - Bench seat
  - Captain’s chair
  - Standing or kneeling

The ‘workplace’ is also a crash scene

Absence of standards and oversight
- Challenges in identifying best practice
- Myriad of unregulated commercial products
- No safety performance standards
- Absent national safety oversight

What we need to consider, where is the ‘bang for buck’ in ambulance transport safety:

1960 to 2009
- A passenger vehicle - sure
- A ‘laundry or mail truck’ - ?
- A passenger vehicle - yes!

“Ambulance transport has a death toll....”
Carl Craigle EMT-P, Chief Platte Valley Ambulance
Nascar Safety Expert

- On ambulance patient compartment
  “It is a death vault”

Tom Gideon,
Head of Safety, GM Nascar

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

There are more safety standards for moving cattle than for moving patients in the USA

the EMS transport process

- communications/dispatch
- the patient
- restraining device/seat
- transporting device/gurney
- 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

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

Is it your service’s tragic year?

- ~ 50 fatalities a year
- 15,000 EMS services
- Each year one in 300 services experiences a fatality
So for EMS personnel...

- What’s going to kill you?
- What’s going to injure you?

Ground Transport Safety IS Complex AND Multidisciplinary

Epidemiological Data Collection
Risk Management
Public Safety
Transport Policy
PPE
Driver Safety
Communications technology
Safety Technology
Regulations and Standards
First Safety Program

Occupational Health and Safety...?

- This IS a Transportation and Automotive Safety issue
- This is a Systems safety issue

What is a survivable impact?

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

\[ v^2 = 2as \]

37 mph (60 km/h) - survivable

62 mph (100 km/h) – not survivable

Role of a head protective device

- A simple, immediate and inexpensive adjunct – a protective device -
  - To protect occupants from hazardous interiors
  - As vehicle crashworthiness design advances
  - As driver training advances
  - For when equipment becomes unsecured
  - As EMS Safety Standards are developed, for both EMS vehicles and EMS occupational safety

Preliminary Study: Attitudes to Head Protection in EMS

16% Would you consider wearing a helmet PRE- PRESENTATION
84% Would you consider wearing a helmet POST

n = 32

82% Yes
18% No
**New EMS helmet prototypes for 2007-2009**

**Problems**
- No Standards
- Unique safety and hazard protection needs
- A number of less than appropriate devices out there

**Hmm...**

**So why is it...**
- That the EMS providers -
  - Wore wearing navy blue — one of the most difficult colors to see at night
  - Had no head protection, when all other emergency personnel at the scene did
  - Had no protective clothing, when other emergency personnel at the scene did???

**It isn't like this outside of the USA**

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

**Ambulance Safety Research: A New Field**

**Best Practices?**
Air EMS is a role model for safety initiatives and focus

Ambulance Standards??
- Australasia
- Europe
- USA
  - KKK?
  - AMD?
  - FMVSS?
  - NFPA?

Standards and Policy
- Operations and fleet management
- Vehicle design safety and crashworthiness
  - Australia: ASA (AS/NZS 4535:1999)
  - USA: KKK-F 2007, AMD 2007 (not by national standardizing bodies)
- Worker and vehicle visibility
  - Some apparel, minimal vehicle visibility standards limited evidence base

Australia & New Zealand Ambulance restraint standard AS/NZS 4535:1999
- "Restraint systems shall apply to all equipment and people carried in an ambulance..."
- Dynamic Testing - 50th & 95th percentile manikins
- 24G in Forward and Rearward
- 16G in Transverse

- Medical vehicles and their equipment - Road Ambulances
- "Without exception, all persons, medical devices, equipment and objects normally carried on the road ambulance shall be maintained to prevent them from becoming a projectile when subject to a force..."
- 50th percentile manikins - 10 G in Forward, Rearward, Transverse & Vertical directions
- Certified by Notified Body and Ambulance Mfg.

What KKK-A-1822F, AMD and FMVSS state and don't state...
USA KKK ambulance purchase specifications
- Specifications for the purchase of a Star of Life
Ambulance
- Static Pull test
- 2200 Lbs. static stretcher test in
longitudinal, lateral & vertical
- No dynamic test for vehicle,
occupants or equipment
- No automotive test manikin
- Voluntary

USA Ambulance Manufacturing
Division (AMD) Ambulance Standards – August 2007
- No dynamic or impact test
- No automotive test manikin
- Mandates NO ‘crumple zone’
- No impact tested anchorages for
occupant restraint or equipment
- Internal, not independent

KKK/AMD
- Ignorant of basic automotive safety
principles -
- Makes no reference to dynamic testing and
YET makes reference to this standard
YET makes reference to this standard
providing protection in the setting of vehicle
Crash forces
- The complete ABSENCE of any real world
injury data applied to the determination of
these test protocols

AMD 2007 - 025 ‘occupant
safety testing’
- Compared with -
- Accepted automotive
safety testing

AMD – static ‘safety testing’
- Inconsistent with automotive safety
principles – and specifies that a ‘successful
test’ is
- No structural damage to any load bearing
or supporting members, i.e., torn or broken
material, broken welds, popped or sheared body
rivets, bolts, and/or fasteners, shall be evident
during the application of the force and after the
release of the force.

Unacceptable, and non-automotive AMD/KKK-F
‘safety testing’ practices and standards ???

AMOUNTS RECOMMEND A MINIMUM of:
- 12,000 lbs.
- 15,000 lms.
- 20,000 lbs.

AMOUNTS RECOMMEND A MINIMUM of:
- 12,000 lbs.
- 15,000 lms.
- 20,000 lbs.

AMOUNTS RECOMMEND A MINIMUM of:
- 12,000 lbs.
- 15,000 lms.
- 20,000 lbs.

FMVSS has a specific exemption for
ambulence vehicles once you are 600mm or 2
feet positioned rearward of the driver
KKK require a ‘national test lab’ to conduct
AMD ‘tests’ BUT NOT an automotive test lab!
No dynamic impact tests AT ALL
No crashworthiness tests
USA Ambulances: FMVSS Exemption

FMVSS exempt......

NFPA Ambulance Standard Development

- NFPA Ambulance Standard Development underway
- Scope for integrating appropriate technical expertise
- The Public Comment period for the development of the new NFPA Ambulance Standard – closed October 15, 2008

Balance of concerns and risk during transport

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

Benefit of Safety

- Safe practices save lives, time and money

What do we know now??

- Intersection crashes are the most lethal
- There are documented hazards, some which can be avoided
- Occupant and equipment restraint with standard belts is effective. (Over the shoulder harnesses for patients should be used, with the gurney in the upright position where medically feasible)
- Some vehicle design features are beneficial - automotive grade padding in head strike areas, seats that can slide toward the patient
- Electronic Driver monitoring/feedback systems appear to be highly effective
- Head protection??

Safety Management

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

Dynamic vs. Static Safety Testing
Dynamic Safety Testing
- requires sophisticated, expensive equipment
- measurably demonstrates forces generated during collision
- accepted international standard for vehicle restraint systems

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

Intrusion
Deceleration


Why do we do this?

Full Vehicle Crash Testing
Test 1 – Right side impact

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

A few key words about restraint systems...

NOT new technical data...


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

USA 2004, NIOSH Head strike zone hazards

NOT new technical data...


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

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.

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

Increasing awareness ...

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.....”

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

Wyoming Ambulance Manufacturer, August 17, 2007..
- “.... the current crop of “Safety Concept Vehicles” being built by some manufacturers are a sham and they do not address the problem but are merely used as a sales gimmick.”

There is NO vehicle safety without real world injury data and automotive safety expertise
- With what authority has ground EMS squandered >$3,000,000 on these concept vehicle shams??
- We NEED meaningful injury data to better understand the mechanism of injury and fatality
- A crash test program without automotive safety expertise and real world representative injury data is irresponsible
- Without real world injury data it is not possible to effectively measure the burden of the hazard NOR the effectiveness of any interventions

Yet another potentially lethal example marketed as a ‘safety innovation’ YET outside of automotive safety practice

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
Innovation

Safety concepts out there now
- Driver feedback technologies
- Tiered dispatch
- Enhanced ambulance vehicle design
- Intelligent Transport Technologies - ITS
- New Safety Standards

Important...
- Ergonomics and automotive safety issues are interrelated
- Crashworthiness priorities override the ergonomic issues

Protective devices/concepts

To prevent a crash
- Driver feedback
- Driver monitoring
- Driver training
- Vehicle Intelligent Transportation System (ITS) technologies
- Tiered dispatch
- Appropriate policies

In the event of a crash
- Vehicle crashworthiness
- Seatbelt/safety belts systems
- Equipment lock downs
- Padding
- Head protection

Hours of service? Not new in other realms of ground transport...

BHP - Key learnings for the organization were:
- Fatalities often have similar underlying causes
- High near miss reporting often correlates with declining injuries or fatalities
- Leadership visibility in the field is vital
- Hazard identification and risk awareness are fundamental to success.
Backup Camera… Shouldn’t all vehicles have one of these?

Ambulance Safety Summit
November 7th, 2008

- EMS Transportation Safety Subcommittee of the National Academies Transportation Research Board (TRB)
- Onsite panel of invited technical experts, in addition to policy makers and EMS leaders.
- Safety data capture
- Transport fleet management, EMS vehicle operations
- Automotive safety and occupant protection
- Ergonomics and human factors
- Standards
- Will be beamed live via Webinar and recorded electronically and TRB e-circular produced
- Access to live participation requires pre-registration
- Pre-registration info disseminated in early October

www.GlobalEMSForum.org
“Running Hot or Not”, “Being Seen at the Scene” and “Ambulance Standards” Webinars

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

Driver issues

- Driver selection
- Driver monitoring and feedback
- Driver Impairment
- Driver training

The “Feedback Box”
Driver behavior monitoring and feedback device

What about changing driver behavior in the real world??

Purpose of ‘Feedback box’ Program
- Enhance Safety
- Improve Driver Performance
- Save Maintenance Dollars
- Aid Accident / Incident Investigation
How the Device Works
- Computerized monitoring device installed on each vehicle to measure parameters
- Each driver has individual key “fob”
- Data collected every second including: vehicle speed and performance, driver behaviors and emergency mode
- Auditory feedback of warning 'growls', and penalty tones
- Data downloaded automatically every day

Demonstrated Effectiveness
- Blind data, no growls
- Growls & tones ON
- Unidentified data capture
- Identified cases

A key to safe ambulance transport

Monitoring and feedback devices
- Implementation well received by the providers.
- 20% cost saving in vehicle maintenance within 6 months.
- No increase in response times
- Fewer crashes and less severe crashes
- Sustained improvement in safety proxies, with no inservice or retraining after the initial introduction period.

Extensive Indirect cost savings
- Fewer out of service vehicles
- Improved transport times
- Decreased administrative lost in managing unsafe behaviors
- Decreased legal burden
- Automatic system wide data
- Insurance benefits
Feedback box Summary

- The system works
  - Objectively improved performance
  - No increase in response times
  - At fault accidents reduced
  - Accepted into the culture

However:
- The system requires monitoring
- Must be reinforced by management
- Must be incentives for good performance
- Must be consequences for poor performance

Other monitoring devices

- Primarily to record events during and immediately preceding a crash
- Give no driver crash prevention feedback
- Administratively burdensome
- Intrusive
- Not demonstrated to be as effective in improving vehicle maintenance costs or as effective in modifying driver behavior long term

You want a system that works!!

- Does the system really work
- Is it going to be a major burden on your staff to implement
- What are the real costs
- Are you going to have video of your company vehicle on YouTube??

Do you want graphic images of the crashes your investment DID NOT HELP YOU AVOID???

The jury is out on

- Opticon
- Simulators

Resource availability and allocation technologies

- VS3M (Visual System Status Management) provides a geographic view of call demand through the application of varying shades of color to indicate density

- Computer Aided Dispatch systems are different in each State & Territory
- Automatic Vehicle Location (AVL) - usually cities only
- Some have Duress alarms in vehicles and on handheld radios
- Crews are alerted by pager, radio or Mobile Data Terminal (MDT)
- Integration of VACCUS notebook electronic case recording nationwide
- Satellite phone communication in some regional and remote areas
The EMS Safety Foundation
Intro and Logistics Webinars from December 11th 2007 & Jan 8th 2008
EMS Safety Foundation tab at www.objectivesafety.net

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.

RETTmobil – ‘Mobile Rescue’
Major European event for EMS innovation Fulda, Germany May 2008
http://www.rettmobil.com/

EMS Safety Foundation’s 2008 RETTmobil Delegation

Vehicle Occupant Safety design
2008 European design
Safety technology is a key focus
Ergonomic design

NSW Australian vehicles

Flexibility to manage two patients

High speed crash, rolled and the occupants (patient and medics) had only minor scratches

Sprinter v Ford Transit crash test

Ergonomic layout and equipment

Awkward tasks? Develop solutions!
Having access to that technical knowledge supports changes to improve safety practice.

Operating in an environment where many aspects of safety are still devoid of safety standards – requires technical knowledge and understanding.

Visibility and lighting issues

Here’s the real world at 6 ft...

Another excellent example - From this to ... this!
News we don't want to see

Caught On Video: EMT Struck By Car

May 21st, 2007, Seattle

USA Worker visibility Act: November 24th 2008

Policy and practice ignorant of existing technical safety data

This addresses some very real risks, very creatively – and currently ONLY available in London Ontario!

Under Way... Emergency Vehicle Visibility and Conspicuity Study

- Funded by the USFA
- Conducted by IFSTA
- Looking at the effectiveness of reflective markings used on emergency vehicles
- Doing best practice research and working with manufacturers

John Killeen, Intensive Care Paramedic
www.ambulancevisibility.com
Emergency Vehicles – Viewer Awareness

For a timely, appropriate and safe response
- Location
- Size
- Shape
- Speed
- Intended path

Estimating size & direction from markings

Avoid a thin waistline!

Contrast Factors with age

- 9% of the general population are colorblind.
- Up to 50% of drivers require glasses or contact lenses to drive.
- Age-related vision degeneration increases after 40 years of age.

Color-blindness affects 10% of the population

- As seen with normal vision
- As seen with color blind vision

Summit County EMS - Colorado
Old vehicle
New yellow vehicle markings
Staff use lime-green vests & jackets

Increasing safety with a 30% cost saving

Queensland Ambulance Australia

Sweden initiatives

Norway initiatives
Other successful models

Ambulance Motorcycles

Response Times

- 77% < 10 minutes (Avg.- 3.5 mins)
- 23% < 5 minutes
- 78% cases in the CBD
- Major events, traffic, tunnels
- Difference between Paramedic responder in a car and a motorcycle to cardiac arrest- 2 minutes avg.
- One pt every 3 days- 5 minutes before assistance can get to them

Cost advantage

- Running costs half that of Subaru Forrester
- Quarter that of a Mercedes Benz
- Total running costs: leasing 3 motorcycles, uniforms, equipment, training, wages- $450 000.
- QALY- WHO $40 000/life saved

Fleet Mix?

So....

- Which vehicle do you want to be in?
- Which is the best for efficient and effective patient care?
- Which vehicle provides optimal risk management?
- What is the optimal fleet mix?

Were we safer in the Cadillac???

Technical information available

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

These folks know what we need to know...

IAFC June 2007

Tips for Emergency Vehicle Operations

An excellent model

USFA Emergency Vehicle Safety Initiative

Traffic Incident Management Systems (TIMS)
- Released April 2008
- FEMA, USFA, IFSTA
- Covers setting up safe roadway incident work areas and using unified command at these incidents

Risk/Hazards
- Predictable risks
- Predictable fatal injuries
- Serious occupational hazard
- Public safety hazards
What do we know works…

- Vehicle Operations Safety Policies
- Squad bench lap seat belts
- Patient over the shoulder harnesses
- Securing equipment
- Forward and rear facing seating
- Some electronic technical devices
- Safety awareness
- Cultural change

What you can do now

- Have a written and implemented ‘safety program’
- Secure all equipment
- Secure occupants with standard belts
- Don’t drive through red lights/stop signs
- Use properly implemented “Feedback Boxes”
- Monitor crash events with common denominators (i.e. per 100,000 miles and per trip)

Important Principles!

1. A culture of safety
2. Drive cautiously
3. Wear your belts & restrain all occupants
4. Secure all equipment
5. Integrate scientific data into your policies and procedures
   - Unrestrained occupants and equipment are a potential injury risk to all occupants

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

small changes can make a BIG DIFFERENCE

PREPARE – TEACH – REACH – RESPOND
- Look at your own safety record
- Teach safety and hazard awareness
- Reach out with safety information to all your EMS providers
- Respond with the best safety practices

R & D

“Ripoff and Duplicate”

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

Safety Path

- Incremental Steps
- Always Forward
- Safer today than yesterday
- System, Vehicles, Operations, Culture

PREDICTABLE PREVENTABLE and NO ACCIDENT

Conclusion

- EMS transport has serious hazards and safety issues
- Major advances in EMS safety research, infrastructure and practice over the past 5 years
- New technologies for vehicle design, occupant PPE and equipment restraint and driver performance are now available
- Development of substantive EMS safety standards is a necessity and a reality
- 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 safety and occupant protection
And….

- It is no longer acceptable for EMS to be functioning outside of automotive safety and PPE safety standards for prevention of and protection of EMS providers and the public from injury and death.

Thank you!
Any Questions??
Electronic handout available online
http://www.objectivesafety.net