

MARYLAND STATE FIREMEN'S ASSOCIATION
 Representing the Volunteer Fire
 Service and Fire Personnel of Maryland

116th Annual Maryland State Fireman's Association
 Convention and Conference, Ocean City, MD, June 17th, 2008

Patient and Provider Safety in Ambulances



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

This morning... June 17th a paramedic and a patient killed


EMS CRASH KILLS PATIENT AND A SUSSEX COUNTY (DE) PARAMEDIC IN THE LINE OF DUTY
 Tuesday, June 17, 2008

We regret to advise you that a Sussex County (DE) Paramedic was killed in the Line of Duty as was a patient killed in a horrific crash involving an ambulance in Sussex County (DE) this morning.

The single vehicle crash happened around 12:40 Hours on the John J. Williams Highway near the Lewis Rehabilitation Center for company substitution in Angola.

The MSJ-Sussex Rescue Squad ambulance was transporting to Berke Medical Center with a patient, 2 MSRS Squad members and the Sussex County Paramedic were on board when it struck a tree, which opened the side of the ambulance in terms on our home page. Tragically, the patient was killed as was the Sussex County EMS Paramedic, who was killed in the Line of Duty.

Sussex County EMS also notified a close call last year when a Paramedic John Schmitt was seriously injured in a crash when a Christian Church Millard Fire Company ambulance he was riding in, while returning from a run. Additional details on this morning's crash will follow.



In this vehicle...



June 17, 2008

Police release names of 2 killed, 2 hurt in ambulance crash

The News Journal

A patient and paramedic died this morning in an ambulance crash in Sussex County when the vehicle seemed to avoid a tree and hit a tree, state police said.

The single-vehicle accident happened about 2:45 a.m. on Del. 28 (John J. Williams Highway) near the Lewis Rehabilitation Center in Angola, state police spokesman Sgt. Joshua Buchwalter said.

According to police, the three-member ambulance crew had just picked up patient Betty J. Hall, 62, of Lewis from Rehabilitation Nursing and Rehabilitation Center in Long Tract and was heading east on Del. 28 en route to Berke Hospital with its emergency equipment activated.

A deer entered the roadway, and driver Michael E. Wiseman, 34, of Fawcett maneuvered to the right to try to avoid the animal. That is when the right side wheels of the ambulance left the roadway, police said. The rear two of the 2003 Ford ambulance struck a tree, creating a large opening on the right side before hitting several additional trees.

Hall and Sussex County Paramedic Stephanie L. Callaway, 31, of Lewis, died in the crash. Callaway was in the rear of the ambulance attending to Hall.

Hall and MSJ-Sussex Rescue Squad emergency medical technician Bruce H. Hickman, 47, of Delapoint were spotted.

Hickman has been admitted to Berke Hospital, where he is listed in serious condition. Wiseman also has been admitted to Berke, where he is in stable condition, police said.

Del. 28 was closed for several hours but has now been reopened.

Delaware State Police will release more details on the accident at 7 p.m. news conference in Georgetown.

► To quote Steve "Sid" Caesar – Director IHS ES

"We want everyone to get home safely each day"

A tragic emergency health care intervention outcome



Rollover Crash Kills Medical Technician
 Ambulance Dies Off Hill And Both Die After Being Run Down by a Patient

It does happen....

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.....

... Nov 8th's Fatality

Putnam Co. paramedic dies in ambulance crash

By Michael Hound
 Herald-Herald
 Copyright 2007 Herald-Herald

VALHALLA, N.Y. — "Severely injured" was the final completed sentence for 25-year-old Matthew Lamb of Lake Carmel, an emergency medical technician and Carmel volunteer firefighter who died last week after the ambulance in which he was riding crashed.

The scene unfolded from happenings on Route 106, and Lamb and one had been taken to Lamb at the Putnam Hill Cemetery. Lamb, his brother, attended the funeral at Putnam Hill.

For a young man who knew when duty called, the medical technician must have been made aware that it was at the very time the ambulance was run down by the truck.

"Matt, we love you. We miss you," Lamb said inside the St. James the Ambulance Church on Wednesday.

It was there that Lamb and Carmel Fire Chief David Johnson swung from chairs to together and back while speaking about work, living with them those things at the time and living the walls.

Johnson recalled Lamb's eagerness to serve, as a teenager joining the Putnam County Sheriff's Office, as well as the Putnam County Sheriff's Office program, when Lamb was on board of the Carmel Department of the Carmel Ambulance.

"Matt became a paramedic with Empire State Ambulance."

"Matt loved and was dedicated to every aspect of the emergency services, so it is no wonder he just let me to the love and dedication," said Johnson, once waving away tears with his white-gloved left hand.

Lamb died Thursday, about a day after the Empire ambulance his 27-year-old EMT partner was driving west off Route 106 in Putnam and about a tree. State police said the driver, Jonathan Roman of 2100 West Putnam, apparently fell asleep. The fire was returning from an alarm sounding call with Lamb.

And Nov 10th's 2007 obituary...

N.Y. EMT killed in ambulance crash laid to rest

By Michael Hound
 Herald-Herald
 Copyright 2007 Herald-Herald

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Transport Science...

EMS Transport Safety

- ▶ 'patient safety'
- AND also
- ▶ 'provider' and 'public safety'

A BIG Problem

- ▶ Operating in an environment where many aspects of safety are still devoid of safety standards – requires detailed technical knowledge and understanding in technical disciplines OUTSIDE of healthcare disciplines

Safety concepts out there now

- ▶ Fleet Safety Management
 - Z-15
 - Driver monitoring and feedback
- ▶ Enhanced ambulance vehicle design
- ▶ Intelligent Transport Technologies - ITS
- ▶ Visibility and Conspicuity
- ▶ New Safety Standards
- ▶ Independent resources and information

<http://www.objectivesafety.net>



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?

Outline

- I. Review of data on ambulance crashes and safety standards and guidelines that exist for the ground EMS
- II. Identification of ground EMS transport safety issues, hazards and areas of risk to patients, providers and public
- III. Highlight unacceptable mythology and challenges to advancing EMS transport safety
- IV. Profile innovation, new safety technologies and strategies and knowledge transfer to enhance safety and reduce risks of ground EMS and patient transport

Thursday July 5th 2007.....



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

Posted by mad at July 5, 2007 4:38 PM (Suggest Removal)
to all the people worried about how fast the emt was going, would it be fast enough if it was your loved one in there.....

| Add your comments

Posted by Concerned at July 5, 2007 4:49 PM (Suggest Removal)
To mad: It would be too fast if they ran over my family member on their way to another's family member....

| Add your comments

Posted by Concerned at July 5, 2007 4:58 PM (Suggest Removal)
To X responder: Why can't I second guess this? A man is dead and I want to know if the actions and situation surrounding this were worth this sort loss. And I'd like to know what can be done so that this never happens again.

Friday July 20th 2007... The worst ambulance crash in USA history

Five Killed in Crash of Ambulance and Semi

July 21, 2007 08:20 AM EDT

VAN WERT, OHIO (AP) -- The Ohio State Highway Patrol continues to investigate the crash of an ambulance that killed five people Friday night, including three emergency medical technicians. Troopers say the ambulance was broadsided by a semitrailer in Crane Township, about 85 miles southwest of Toledo.

The ambulance, with four Antwerp Emergency Medical Services workers aboard, was taking two victims from an earlier car crash to a hospital. Troopers say it was broadsided by a tractor-trailer at the intersection of County Road 176 and County Road 87. The ambulance then burst into flames.

The Highway Patrol says three EMS workers were killed. They were identified as 44-year-old Sunny Smith, 31-year-old Heidi McDougall and 31-year-old Kelly Eager. The two patients were also dead. They were identified as one-year-old Robert Wally, 60-year-old Arnelita Wally of Mcsville.

Another emergency medical technician, Matt McDougall, and the truck driver, Gerald Chapman, Jr. of Indiana, were both taken to the hospital. It's not yet clear whether they suffered any injuries.

Authorities have not said who had the right of way at the road intersection nor have they said if the ambulance's emergency siren and lights were turned on.

Antwerp fire chief says, "They were doing what they loved..."

Emergency personnel throughout the region are also shocked and mourning their own.

"That's one of our worst scenarios when it's one of our own," said Con Shuehek of the Payne Fire Department.

"Everyone is a brotherhood," said Friend. "Everybody looks after everybody."

Randy Shaffer, director of Paulding County Emergency Management Agency, said the accident has had a deep impact.

"It has affected every emergency personnel in the county," he said. "We know it could happen at any time. We read about it in our newsletter. We just don't think it's going to happen to us."

Shaffer said when a call came in that an ambulance was involved in an accident Friday, "I think every squad in the county activated."

Jan 28th, 2008

1 dead, others injured in Sussex crash involving ambulance

Monday, January 28, 2008 10:14 AM

Posted at 7:33 am | 3 Comments

Collision happened at the intersection of Beaver Dam and Indian Mission roads near Angolia Leuch...



An interhospital transport ? "Do no harm...."?

Data last updated Tuesday, January 25, 11:11:02

Pa. ambulance involved in crash; patient pronounced dead at scene

By Nicole H. Funn
The York Dispatch (Pennsylvania)
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An Adams County ambulance, making a patient transport to York Hospital, collided with a car at the intersection of York 20 and 215 in West Manchester Township at 1:47 p.m. on Jan. 25.

York County Deputy Coroner Claude Staley said the patient, a woman, was being transported from Salisbury Hospital to York. She was pronounced dead at the scene.

The ambulance was carrying a patient who was pronounced dead at the scene. Staley said the ambulance was involved in a collision with a car at the intersection of York 20 and 215 in West Manchester Township at 1:47 p.m. on Jan. 25.

Charged with Vehicular Homicide

Penntwp. ambulance driver faces charges in crash - Pennsylvania

A Penn Township Rescue & ambulance driver faces a charge of homicide by vehicle in an Oct. 30 accident in Mansfield that killed a Westmoreland County prison guard.

A Penn Township Rescue & ambulance driver faces a charge of homicide by vehicle in an Oct. 30 accident in Mansfield that killed a Westmoreland County prison guard.

Jason Falt, 30, of 9950 Barnes Lake Road, North Huntingdon, was arraigned this week and will have a preliminary hearing at 1:45 p.m. Sept. 27 before Jeannette District Judge Joseph DeMarcho. Bond was set at \$25,000 unsecured. Falt also was charged with reckless driving, careless driving and other traffic offenses.

State police at Greensburg said Falt was driving an ambulance west on Route 130 at 5:49 a.m. Oct. 30 when he ran a red light at North Greengate Road and hit a Ford Bronco driven by Frank Scalise Jr., 46, of Marysville, that was traveling south.

Scalise, who began working at the prison in 1992, was reportedly on his way there at the time. According to the coroner's report, Scalise was taken by medical helicopter to UPMC Pittsburgh. He died Nov. 3 of blunt-force trauma to the head, according to the Allegheny County Medical Examiner's Office.

Falt was not injured, but the ambulance was heavily damaged. Police indicated the ambulance was returning to its station after transporting a patient and did not have lights or sirens activated. Asked about Falt's employment status Friday, a representative of the ambulance association had no comment.

2 killed, 3 injured.... September 23, 2007 - PA

Car, Ambulance Collide in Marshall Township; 2 Dead

09/23/07 10:08 am EDT September 23, 2007

09/23/07 08:00 am EDT September 23, 2007

MARSHALL TOWNSHIP, Pa. -- An ambulance and car collided along Route 19 at Troublesome Road in Marshall Township Sunday, killing two people and injuring three others.

Police said Douglas Det. 31, of Mercer, and Philip Bacon, 31, of Sharpsville, were driving a car at about 2:30 a.m. when their vehicle and the ambulance collided.

The Marshall Township road both Det and Bacon died of head injuries.

Three people riding in a Chubbey Township ambulance were also injured. Their conditions and names have not been released.

The three injured victims remain in the hospital.

2 counts of vehicular homicide... November 5, 2007 - PA

Drunken ambulance driver killed 2 in car crash - Pennsylvania

A 22-year-old ambulance driver drank before her shift and was impaired when she collided with a car in Marshall, killing two men instantly, Allegheny County District Attorney Stephen A. Zappala Jr. said today.

Shanea Leigh Climo, 22, of Evans City, is charged with two counts of homicide by vehicle and involuntary manslaughter, driving under the influence and several traffic offenses in the Sept. 23 collision at Perry Highway and Brush Creek Road. She was arrested this morning, arraigned and released on her own recognizance, authorities said.

Police said an on-board camera system in the ambulance helped them decide to file charges. The camera allegedly shows the face of the driver, Shanea Climo.

Zappala said Climo was traveling south on Route 19, transporting a patient with a do-not-resuscitate order to UPMC Passavant, when she ran a red light and hit a Chevrolet Cavalier driven by Douglas Stitt, Stitt and a passenger, Philip Bacon, were killed.

The patient later died, but his death was not believed to be related to the crash, Zappala said.

Firstly!

An accident ?

or
a predictable and preventable event

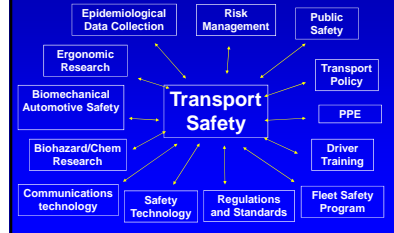
In a nutshell

- ▶ Am here to try to save you
Lives
Time and
Money

Key Elements to Safety

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

Ground Transport Safety IS Complex AND Multidisciplinary



Transport oversight?

- ▶ In contrast to the bus and truck industries, which have -
 - comprehensive safety oversight
 - transportation safety interventions
 - transportation safety data capture via the Federal Motor Carrier Safety Administration (FMCSA)
- ▶ EMS has been focused more as an acute health care delivery and emergency medical service and largely **outside** of much of the other transportation oversight infrastructure that exists

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



A Simple Question....

WINGS, WHEELS & ROTORS
Vol. 25, Issue 2 • April 2006
Air & Surface Transport Nurses Association

A Simple Question
Annie Latta, MS, RN

Why have all these more comprehensive safety oversight, transportation safety interventions, transportation safety data capture via the Federal Motor Carrier Safety Administration (FMCSA) and largely outside of much of the other transportation oversight infrastructure that exists?

Fatalities and funerals

Funeral Services Held For Marble Falls Paramedic
Local News

Funeral services were held for a paramedic who died in a crash on Highway 75 near Marble Falls and local services for Hanson were held in Austin and Marble Falls.

It was an emotional day for Hanson's family and his fellow emergency workers, but also a somber one for those who gathered to pay tribute to a man who died in a crash on Highway 75 near Marble Falls and local services for Hanson were held in Austin and Marble Falls.

New Information 2006-2008

- ▶ 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
- ▶ AMD Engineering Public Comments, July 2007
- ▶ KKK-F, August 2007
- ▶ OSHA September 11, 2007 Federal Register
- ▶ SAFETEA-LU, 2006
 - (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users)
- ▶ State Strategic Highway Safety Plans, October 2007
- ▶ State EMS Council Policies
- ▶ APHA, Nov 2007
- ▶ OSHA EMS best practices late 2008
- ▶ Transportation Research Board – Inaugural EMS Safety Subcommittee meeting Jan 2008
- ▶ Worker visibility Act, to be implemented, Nov 2008

Can no longer say –
“I didn't know....”

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

Unique workplace

- ▶ In vehicles
- ▶ At roadside and other emergency scenes

Absence of standards and oversight

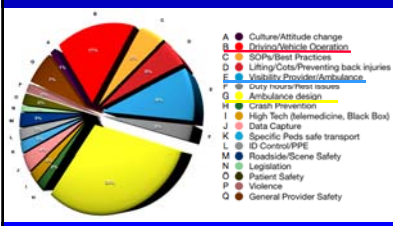
- ▶ Challenges in identifying best practice
- ▶ Myriad of unregulated commercial products
- ▶ No safety performance standards
- ▶ Absent national safety oversight

- ▶ What we need to consider, where is the 'bang for buck' in ambulance transport safety:

New paradigm - Integration of EMS

- ▶ Public health departments
- ▶ Social service agencies
- ▶ Community outreach
- ▶ Hospitals
- ▶ Health care networks / Insurers
- ▶ Industry

Key 5 Safety Priority areas of focus Here is what you sent in: n = 155



Challenges to Optimizing EMS Transport Safety

- ▶ Disparate and fragmented safety infrastructure
- ▶ Lack of a centralized EMS Safety oversight or data
- ▶ A large number of small groups of end users, with a mix of volunteers and professionals
- ▶ Ambulances are hybrid non-standard vehicles, a truck chassis and an after market box or a modified van
- ▶ EMS vehicle safety is not integrated as a part of the transport safety industry

1960 to 2007



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

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

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

Clinical Care? Occupational Health and Safety.....?

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

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



The Emergency Department (ED)



An ambulance is not an ED /ICU on wheels



National EMS data

In the USA*

- ▶ ~ 50,000 vehicles
- ▶ ~ 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

*NASS/HTS 2005-6

Is it your service's tragic year?

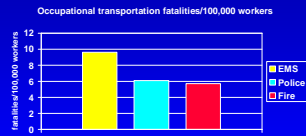
- ▶ ~ 50 fatalities a year
- ▶ 15,000 EMS services
- ▶ Each year one in 300 services experiences a fatality

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##

*Wahrli CA, Pinnault RS, Kuhn EM. *Phonop Emergency Care* 2001; Jul-Sep;5(3):281-9
 **Baker, Zelenko, Savaris, et al. *Emerg Med* 2003
 ***Maguire, Hunting, Smith, Levick, *Annals of Emergency Medicine* Dec 2002
 ##WJOT 2003
 ##Wahrli CA, Pinnault RS, Kuhn EM. *Phonop Emergency Care* 2005; Dec; 9:412-419

Occupational transportation fatalities..



▶ WE HAVE A BIG PROBLEM HERE

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

'Workplace' Hazards



and what is killing EMS ?

EMS personnel fatalities*

- ▶ 74% transportation related
 - * 1/5 of ground transport fatalities were struck by moving vehicles
- ▶ 11% were cardiovascular
- ▶ 9% were homicide
- ▶ 4% needle sticks, electrocution, drowning and other

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

What do ambulance crashes really cost ?

- ▶ Loss of life and injury
- ▶ Negative impact on EMS system
- ▶ Collisions are the largest liability cost and exceeds 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
 - * litigation /settlement/lawsuit
 - * medical/disability costs of injured EMTs
 - * hiring of new employees to replace injured personnel
 - * restraining and psychological counseling of personnel involved and others
 - * increased insurance rates

Safety is Good Business





A problem

2007 Insurance data –

- ▶ **27** fold more likely to have a claim based on transport than related to medical care

▶ “Ambulance transport has a death toll....”

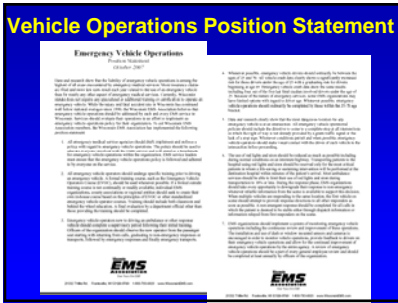
*Carl Craigle EMT-P, Chief Platte Valley Ambulance
Colorado Springs, April 2007*



“Are our policies killing people?”

- ▶ 1991-2000, 302,969 Emergency vehicles were involved in MVCs - 1,565 involving fatalities*
- ▶ In PA 1997-2001, ambulances were more likely than similar sized vehicles to be involved in:
 - + 4 way intersection crashes (43% vs 23%, p=0.001)
 - + Collisions at traffic signals (37% vs 18%, p=0.001)
 - + MVCs with more people injured (76% vs 61%, p=0.001)

*Comparison of Crashes Involving Ambulances with those of similar sized vehicles – Adam Ray, Douglas Kupas, PEC Dec 2005;9:412-415



WEMSA – October 2007

1. Emergency Vehicle Operations Policy
2. Vehicle operations training and evaluation
3. A program of graduated driver responsibility
4. Drivers only age 25 and over
5. Complete stop at an intersection
6. Restricted use of Red Lights and Sirens
7. Monitoring of emergency vehicle operations

WEMSA covered some key and important policies and procedures But....

- ▶ What about hours of service?
- ▶ What about visibility at the scene? For providers and the vehicles...?
- ▶ What about protective equipment?
- ▶ What about ambulance design safety?
- ▶ What about reporting of adverse events?



But what about head protection?



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

Problems

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

EMS has unique head protection needs – not well met by a 'truncated' fire helmet...



New EMS helmet prototypes designed by international EMS helmet technical experts for 2007-2008



What are the solutions?

- ▶ Training?
- ▶ Practice Policy?
- ▶ Transportation Systems Engineering?
- ▶ Automotive Engineering?
- ▶ Education of other road users???

The Driver

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

Driver issues

2007-2008-01-01
The Relationship Between Ambulance Crashes and Emergency Medical Technicians Age
 Andrew A. Stokich and Eric Patten
The American Journal of Emergency Medicine, Volume 25, No. 1, 2007

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.

Which is best, how many hours...??



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. Levick, 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 Levick
Objective Safety LLC
United States of America
Loren Wieruch
Michael E. Nagel
Columbia Ambulance
United States of America
Paper Number 040234

Purpose of 'Feedback box' Program

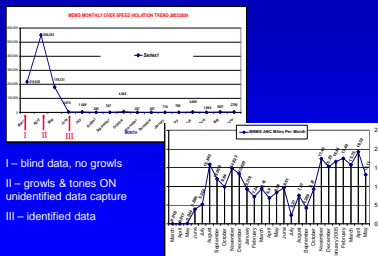
- ▶ Enhance Safety
- ▶ Improve Driver Performance
- ▶ Save Maintenance Dollars
- ▶ Aid Accident / Incident Investigation

How the Device Works

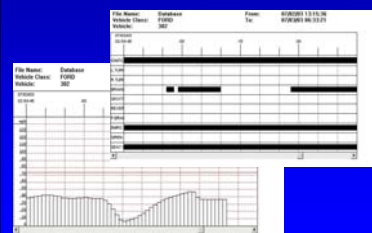
- ▶ Computerized monitoring device installed on each vehicle to measure parameters
- ▶ Each driver has individual key "fob"
- ▶ Data collected every second
 - including: vehicle speed and performance, driver behaviors and emergency mode
- ▶ Auditory feedback of warning 'growls', and penalty tones
- ▶ Data downloaded automatically every day



Demonstrated Effectiveness



Unit 302 Accident



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.

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 you tube??

The jury is out on

- ▶ Opticon
- ▶ Simulators

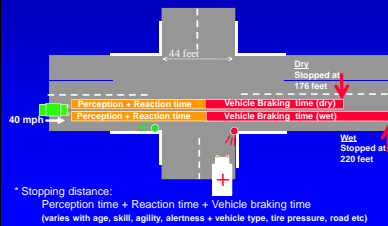
And very Predictable...

- ▶ 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



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

Intrusion vs Deceleration

- ▶ Intrusion
= vehicle to vehicle or vehicle to fixed narrow object
- ▶ Deceleration
= sudden stop – ie. sled test

If we know this – and its published....




Levick NR, et al. Development and Application of a Dynamic Testing Procedure for Ambulance Pediatric Restraint Systems, SAE Australasia 1998;582:45-51

Why do we do this?



USA ambulance purchase specifications GSA:KKK-A-1822F, Aug 2007

- ▶ Static Pull test
- ▶ 2200 Lbs. (8G's) in Longitudinal and Lateral
- ▶ No dynamic test
- ▶ No definition to manikin mass
- ▶ No restraint for equipment
- ▶ Voluntary






AMD 2007 – ‘safety testing’

- ▶ Ignorant of 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 ridiculous current 2007 USA ambulance ‘safety testing’ practices !!??

AMBULANCE TEST RECORD BROKEN

38,000 lbs 	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. **-MORE INFO**

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

KKK certified and FMVSS exempt..?

2 dead in Michigan ambulance crash

The Associated Press
GRANDIA TOWNSHIP, Mich. (AP) — Michigan state police say the truck was stopped in Township waiting for traffic General Hospital rear-end. Investigators found no evidence. Ambulance patient Carrie Cornell, died at the scene member, Ryan Peterson, 2



FMVSS exempt.....



And today's crash.... It was just a roadside tree ...




Its not magic... what is safe is known and understood



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

The Ride of Your Life....

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 sidefacing occupants are potentially lethal – and is in **NO WAY SUPPORTED BY ANY DATA OR AUTOMOTIVE SAFETY EXPERTISE**

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

NO automotive safety engineer
NO crashworthiness engineer
NO ergonomist
NO reference to ANY existing or relevant automotive safety or crashworthiness technical publications....
yet multiple occupant fatalities and injuries annually....

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

The EMS Safety Foundation
Intro and Logistics Webinars from December 11th 2007 & Jan 8th 2008
EMS Safety Foundation tab at
www.objectivesafety.net

Ambulance Transport Safety Task Force (ATS) and the National Transportation Safety Board (NTSB)

National Academies Transportation Research Board's (TRB) And Your New EMS Transport Safety Subcommittee



TRB EMS Safety Update

- ▶ Brought together NHTSA, FHWA, TRB, National Academies, DOT, CAMTS & EMS
- ▶ 3 presentations
 - TRB and EMS
 - Safety air/ground
 - Ground Ambulance Safety Issues and Directions
- ▶ Recorded presentations and handouts available at www.objectivesafety.net
- ▶ Potential for EMS safety research funding
- ▶ Next TRB meeting January 11-15, 2009 – all are welcome

Ambulance Transportation Safety Task Force January 25th 2008



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 event for EMS innovation Fulda, Germany <http://www.rettmobil.com/>



Vehicle Occupant Safety design

2007 European design
Safety technology is a key focus





Securing equipment

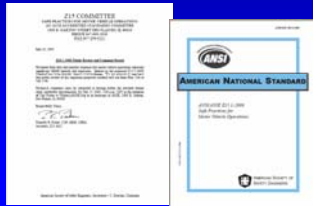


Safety concepts out there now

- ▶ Fleet Safety Management
 - Z-15
 - Driver monitoring and feedback
- ▶ Enhanced ambulance vehicle design
- ▶ Intelligent Transport Technologies - ITS
- ▶ Visibility and Conspicuity
- ▶ New Safety Standards
- ▶ Life Safety Initiatives
- ▶ Resources and information

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

Hmm...



So why is it...

- ▶ That the EMS providers -
 - Were 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???

News we don't want to see

Jan 22, 2007 4:29 am US/Eastern

Caught On Video: EMT Struck By Car

Local News Reporting

(CBS) BROW The car hit 46-year-old Capt. Steven Quindongo so violently it smashed the vehicle's windshield and sent him flying through the air.

Quindongo, a 17-year veteran of the city's emergency medical services, was on the scene of a fire on Riverside Avenue in the Bronx Sunday afternoon when a civilian car moved past police barricades and caught him from behind. Chief Wayne McFarland was on the scene as the damaged health food store where his men had successfully put out the flames.

"We had two firefighter minor injuries," he told us, "and they were taking care of our men and when he (Quindongo) was walking back to the ambulance he was struck by the civilian vehicle."

Worker visibility Act: Help is on the way !! November 24th 2008

PART 634—WORKER VISIBILITY

634.1 Purpose.

634.2 Reference.

634.3 Date.

634.4 Compliance date.

Amended by 2008-0004, 2008-1188A, 2008-01, and 2008-02, 2008-03, 2008-04, 2008-05, and 2008-06.

634.1 Purpose. All new motor vehicles registered in this State shall be equipped with conspicuity equipment within the work area that meets the requirements of this section.

634.2 Reference. Workers' safety personnel on fire vehicles shall place them within the right-of-way of a Federal-aid highway, such as highway construction and maintenance zones, safety zones, utility zones, and other high-visibility safety zones.

634.3 Date. This section shall become effective on the date of publication in the State Register.

634.4 Compliance date. This section shall become effective on the date of publication in the State Register.

There are grants to assist you..

Federally-Mandated Worker Visibility Regulation Summary

The Occupational Safety and Health Administration (OSHA) has issued a new regulation requiring employers to ensure that workers wearing high-visibility safety vests are clearly visible to others in the workplace. The regulation, which is effective as of August 1, 2015, applies to all employers with federal contracts or subcontracts that contain the Federal Acquisition Regulation (FAR) E-Verify clause. The regulation requires that high-visibility safety vests must be clearly visible to others in the workplace, and that they must be worn in all areas where there is a potential for conflict with machinery, equipment, or other workers.



The new regulation requires the wearing of high-visibility safety vests in all areas where there is a potential for conflict with machinery, equipment, or other workers. The regulation also requires that high-visibility safety vests must be clearly visible to others in the workplace, and that they must be worn in all areas where there is a potential for conflict with machinery, equipment, or other workers.

Science not, next best guess

UMTRI UNIVERSITY OF MICHIGAN TRANSPORTATION RESEARCH INSTITUTE

Human Factors - Industry Affiliation Program (IAP)

Industry Affiliation Program for Human Factors in Transportation Safety

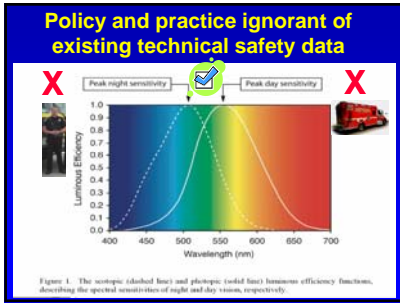
The purpose of this program is to provide a forum for the exchange of information and ideas between researchers and industry practitioners. The program is designed to facilitate the development of research projects that address the needs of the transportation industry.

Recent Visibility Webinar

www.GlobalEMSForum.org

Webinar content includes:

- Automotive OEMs releases Emergency Vehicle Safety Study of Emergency Vehicle Visibility and Conspicuity - Partnership with the International Fire Service Training Association (IFSTA)
- Daylight color sensitivity is very different, especially for blues and reds, at the ends of the spectrum

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




▶ 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



R & D
“Ripoff and Duplicate”

▶ Avoid reinventing the wheel at all costs

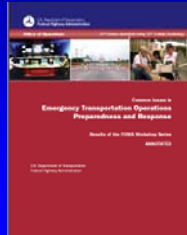
▶ Where are the best practices that we need to transfer knowledge from



UPS: The 'Big Brown'

- ▶ No left turns – instead make three rights
- ▶ Don't back up
- ▶ Don't employ any drivers under 25 years of age
- ▶ Don't employ anyone with a history of driving convictions

March 2007 - FHWA



Tips for Emergency Vehicle Operations



USFA Emergency Vehicle Safety Initiative



Traffic Incident Management Systems (TIMS)

- ▶ Just released April 2008
- ▶ FEMA, USFA, IFSTA
- ▶ Covers setting up safe roadway incident work areas and using unified command at these incidents



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

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?**

Were we safer in the Cadillac???



Risk/Hazards

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

Creating a Safety Culture

within a company must start with upper management's commitment to safety

- ▶ Awareness
- ▶ Training
- ▶ Incentive

Some simple and available solutions out there now

- ▶ Intersection Policy
- ▶ PPE
- ▶ 'Feedback' boxes

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 (ie. 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

**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>

