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Ambulance Safety Issues: Hazard Analysis and Crashworthiness, Where is the State of the Art?



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A tragic emergency health care intervention outcome



It does happen....

Even in Norway....

En alvorlig skudd etter ambulanseskollisjon

(VG Dags) En person ble alvorlig skadd etter at en personbil og en ambulans krasjet. En person ble drept i 10 minuttene etter.

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Norway...

- ▶ Norway is a leader globally in ambulance vehicle safety design and performance
- ▶ Norway is a leader globally in ambulance driver training safety
- ▶ Norway is a leader in ambulance personnel safety equipment and design

Vehicles, Equipment AND Driver Training and Licencing



<http://www.objectivesafety.net>
gratis online ambulance safety information

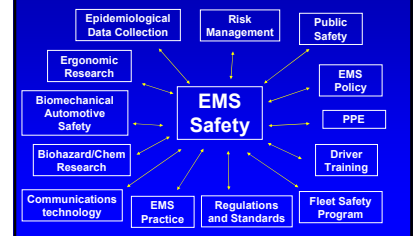


the EMS process

- ▶ 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



EMS Transport Safety IS Complex AND Multidisciplinary



The Crash Event - Crash Testing

- ▶ An introduction
- ▶ What one needs to know
- ▶ What do the tests really mean
- ▶ And, what tests are meaningful



The 'workplace' IS a vehicle

- ▶ Providers often in vulnerable positions during transport.
 - Bench seat
 - Captains chair
 - Standing or kneeling



Hazards



It does happen....

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

New EMS helmet prototypes for 2006-2007



Hmm...





- ### A number of potential interventions to enhance safety have been identified:
- ▶ Safety Policy
 - ▶ Safety performance standards
 - ▶ Vehicle crashworthiness
 - ▶ Vehicle interior ergonomics
 - ▶ Personal Protective Equipment design
 - ▶ Driver training and simulation
 - ▶ Safety and risk awareness modification
 - ▶ Risk behavior modification
 - ▶ Intelligent Transportation Systems (ITS)

The "Black Box"

Driver behavior monitoring and feedback device

How to modify the risk-taking behaviour of emergency medical service drivers?

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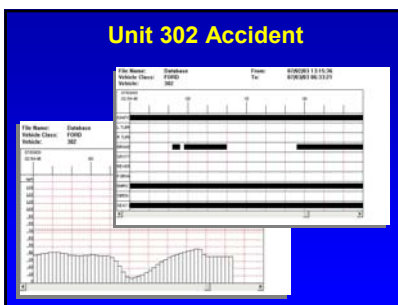
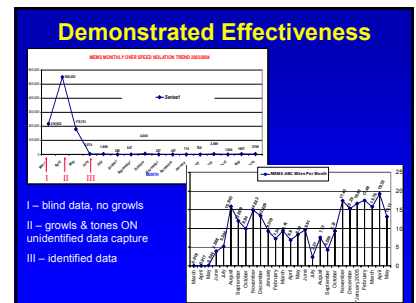
Dr. Steven A. Green, PhD, UCLA PA, Van Nuys CA, Southwest MS

Programs conclude that for record few units only a small amount of time is gained by high speeds, and an aggressive style of driving. Furthermore, we are convinced that a "black box" is a good tool to modify the risk-taking behaviour of emergency medical service drivers.

High speeds are a significant risk factor for emergency medical service drivers. Consequently, modified emergency medical service vehicles have an increased collision risk. We report on the studies designed to modify the risk-taking behaviour of emergency medical service drivers.

- ### Purpose of 'Black 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 spectrum of 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



- ### 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.

- ### What we know that helps:
- ▶ Have safety policies and procedures
 - ▶ Crashworthy vehicles and design
 - ▶ Secure providers and other seated occupants with existing restraints
 - ▶ Secure patient with over the shoulder harness
 - ▶ Secure Equipment
 - ▶ Effective driver training and licencing programs
 - ▶ Use driver and vehicle monitoring and feedback technology
 - ▶ Protective equipment
 - ▶ Use tiered dispatch

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

**PREDICTABLE
PREVENTABLE
and
NO ACCIDENT**

Conclusion

- ▶ Major advances in EMS safety research, infrastructure and practice over the past 5 years
- ▶ There are clear and very serious safety risks and hazards in ambulance transport
- ▶ Technologies for safe vehicle design, occupant PPE and equipment restraint and driver performance are available
- ▶ Enhanced cross disciplinary and global collaboration in development and dissemination of safety initiatives are key