“EMS professionals face many risks – exposure to infectious diseases, violence, hazardous scenes, and oncoming traffic, to name a few. However, none of these risks compares to the potential for death and injury that is associated with driving an ambulance. ... Rural EMS providers are at even greater risk because when the ambulance they are driving or riding in crashes, there is a greater likelihood that they will be killed or sustain a serious injury than is the case in urban areas."

Source: HSRA, 2008
Rural EMS Driver Safety

N. Sanddal
Critical Illness and Trauma Foundation
N. Ward, S. Albert, L. Stanley
Western Transportation Institute
Case Study

- Rural Car Crash
  - Elderly male with moderate orthopaedic injury
  - Transported to local Critical Access Hospital
  - No orthopaedist available at local hospital

- Transfer
  - 60 Miles, Secondary Roadway
    - Steep shoulders, narrow roadway, blind curves/hills, steep pass
    - Ambulance using lights and sirens

- Crash (r. front wheel off roadway, over correction, rollover)

- Results
  - Patient death
  - EMT injury
  - Devastation of volunteer service
Injury and Disease

Source: Injury Facts, 2002
Work-related Fatalities

Manner in which workplace fatalities occurred, 2006

- Highway (23%)
- Transportation incidents (42%)
- Contact with objects and equipment (17%)
- Falls (14%)
- Struck by object (10%)
- Fall to lower level (13%)
- Homicide (9%)
- Assaults and violent acts (13%)
- Exposure to harmful substances and environments (9%)
- Fires and explosions (3%)

(Total fatalities = 5,840)

NOTE: Percentages may not add to totals because of rounding

More work-related fatalities resulted from transportation incidents than from any other event. Highway incidents alone accounted for nearly one out of every four fatal work injuries in 2006.

Source: Bureau of Labor Statistics, 2005
EMS Fatalities

Source: Maguire et al., 2002
Magnitude of the Problem

- 1991-2000*
  - 300 fatal crashes
  - 82 deaths in ambulance
  - 275 others
- Dispatch data**
  - 6500 crashes/year
  - 10 people per day injured
  - 1 person killed every 10 days
Emergency Vehicles

Percentage of Crashes that were Fatal (1988 - 1997)

Ambulance (EMS): 0.82%
Fire (1.49): 0.55%
Police (1.37): 0.60%

Source: Becker et al., 2003
Rural Traffic Safety

Describing Rural Differences

Pennsylvania

- Study of 1745 ambulance crashes over 4 years
- 311 in rural areas/1434 in urban areas

- Rural crashes
  - Single vehicle
  - Due to environmental or vehicle factors

- Urban crashes
  - Involve intersections, other vehicles
  - Injury severity similar in urban and rural
Attributes of Roadway

- Similar to other “rural roadway” descriptions.
  - Narrow
  - Limited shoulder
  - Steep barrow pits
- Rural crashes*
  - More likely to occur on snowy roads
  - Nighttime without street lighting
Attributes of Vehicles

- Increasingly Larger – F-450
- Analysis by vehicle type
  - More people per crash
  - More injuries per crash*
- High Center of Gravity
- Difficult to Secure Patient, EMT **
- Sharp corners
- Loose Equipment
Attributes of Drivers

- Rural EMS workforce
  - Older (Educated)
  - Trained at EMT-Basic
  - Volunteer
  - Variable training requirements, e.g. EVOC, training by insurance companies
  - Irregular and infrequent use of skills
Ambulance Crash Reduction Strategies

3 E’s

- Education
- Engineering
- Enforcement
Education

- Simulator Training
- Employee Knowledge of Traffic Laws
- Continuous Reinforcement of Policies and driving protocols
Enforcement

- Use of safety restraint systems
- Policies concerning lights and siren use
- Screening of vehicle operators
- Ongoing quality management
  - Emphasis on responsibility (primum non noncere)
- Vehicle maintenance
- Shift scheduling - Fatigue avoidance
- Graduated driving responsibilities
- National standard reporting system
Engineering

- Design and placement of seats and restraint systems in rear compartment
- Ambulance redesign with engineering science and testing
- External cameras for backing
- Turn and brake signal indicators in rear compartment
- Crash avoidance systems
  - Animal detection/avoidance systems
Technological “Support”

- Black Box*
  - Increases occupant safety system use
  - Decreases hard braking
  - Decreases speed
    - Does not increase response time
- DriveCam, reportedly similar results
  - WTI/CIT currently exploring use and impact in rural areas
Safety Intervention

Teen Driver Study Weekly Report

Driver: Your name
Week: Week 7 – Friday, June 30th to Thursday, July 6th, 2006

Weekly Comparison

This Week's Events
- Number of overall events recorded: 7
- Number of false triggers (e.g., pothole): 3
- Number of events requiring feedback: 4

Safety-relevant video file names and comments
1. D07_W07_1879
   Brakes late for vehicle ahead stopping to make a left turn in left turning lane. Driver is distracted by car behind. On cell phone after the event occurs.
2. D07_W07_1905
   Brakes hard to stop for a stop sign.
3. D07_W07_1906
   Sees sheriff parked on side of road and brakes hard to stop for a flashing yellow light when there is no other traffic present.
4. D07_W07_1907
   Took the turn too fast going from highway to gravel - passenger not happy.

Other safety-relevant events recorded:
None

Seatbelt use for driver: 100%
Seatbelt use of passengers: 100% (4/4)

Goals for next week
- Look further ahead and slow down sooner to avoid having to brake hard for turns and stop signs.
- Slow down for the turns, especially on gravel roads.

Source: University of Iowa (D. McGehee)
Example
Safety
Ancillary Benefits

- Liability
- Retention/Training/Reinforcement
- Maintenance
Liability
Reinforcement
WTI/CIT Research Program

- Baseline Data
  - Best Practice?
  - Risk Factors?
  - Driving Errors?

- Safety Intervention
  - Feedback?
  - Review and Remedial?
  - Acceptability?
Rural EMS Research Project

Task 1
Task analysis

Task 2
Crash factor

Task 4
Review /

Task 3
Install / Demo

Task 5
Design

Potential effectiveness and acceptance

What are standards for good Performance? What is our Target?

What are the risk behaviors? What are we trying to change?
West Yellowstone
946 square miles
10,000 service population
11 volunteer; 8 paid
EVOC training

Butte
12,006 square miles
35,000 service population
0 volunteer; 26 paid
Insurance company

Big Timber
1800 square miles
3,500 service population
32 volunteer; 0 paid
EVOC training
Summary

- Emergency medical personnel are more likely to be killed in on the job crashes than either fire or police vehicles (9.6/100,000 EMS, 4.5 Fire, 6.3 Law)
- Not just an EMS issue: 3 times more non EMS personnel die as a result of ambulance crashes than EMS providers themselves.
- Significant rural highway safety issue.
- Opportunities abound for research and collaborative problem solving.
- Rural context requires appropriate solutions.