

# SAFETY IN NUMBERS

## A SURVEY ON AMBULANCE PATIENT COMPARTMENT SAFETY

**E**MTs and paramedics are some of our nation's most valuable resources. The general public not only depends on the services of EMS crews to provide critical prehospital care and medical transport, but also to respond during catastrophic national events.<sup>1</sup> Emergency response to recent man-made and natural catastrophes, including 9/11 and hurricanes Katrina and Rita, have emphasized the importance of maintaining and protecting a highly trained and dedicated EMS workforce. The preservation and protection of the health and safety of prehospital providers is of utmost importance, not only from the ethical perspective of providing a safe workplace, but as a matter of safety for all citizens nationwide.

Working in a literally mobile environment, often in traffic, is by nature a dangerous occupational activity. In many systems, providers must still stand, kneel and otherwise move about the patient compartment in order to access the patient, supplies and communications equipment. Unsecured equipment—and even the patients themselves—can become projectiles during a crash or sudden maneuver, adding another potential hazard in the ambulance. Redesigning the patient compartment appears prudent. However, due to the limited space in which to work, changing the vehicle specifications to facilitate a clinical task will affect areas of equipment placement and storage.<sup>2</sup>

Therefore, the National Registry of EMTs (NREMT) and the National Highway Traffic Safety Administration (NHTSA) designed a study in 2004 to identify occupational safety issues associated with working in an ambulance safety compartment and to reveal areas for further research. The results show a compelling need for increased safety measures and ambulance modifications that eliminate the obstacles to compliance with safe practices.

### METHODS

In 1999, the NREMT implemented the Longitudinal Emergency Medical Technician Attributes and Demographics Study (LEADS). The annual survey gathers data on the EMT population regarding basic demographics and work-related issues. In addition, a set of supplemental questions, or a "snapshot," is also administered each year.

In 2004, an ambulance safety snapshot was developed and administered jointly by the NREMT and NHTSA; the National Institute for Occupational Safety and Health (NIOSH) provided technical advice on the questionnaire and data analysis. The questions addressed work habits related to injury risk and exposure, as well as perceptions regarding vehicle occupant restraint use. (For specifics on the data collection and analysis, see "Snapshot Specs," p. 90.)

This study is based on a sample of 5,533 EMTs and paramedics registered with the NREMT as of September 2004. Of those sampled, 1,773 (32.0%) responded. (For more details on the strata sizes and response rates, see Table 1.)

### RESULTS

To reduce the likelihood of injury should a collision occur, providers and equipment within an ambulance should always be secured. When transporting patients (as emergency or non-emergency), EMS providers currently sit either in a side-facing position (on the squad bench or CPR seat) or in a rear-facing position (in the airway seat or captain's chair).

Seventy-eight percent reported using a side-facing position. Sixty-seven percent had transported two or more patients simultaneously at least once in the past 12 months. Twenty-one percent of respondents reported using seat belts in the patient compartment all or most of the time during scheduled (non-emergency) transports, whereas only 12% reported using seat belts all or most of the time during emergency transports.

To evaluate the potential user acceptance of possible injury interventions, respondents were asked about probable use of safety equipment not typically available in ambulances. Fifty-five percent of the respondents said that if patient compartment restraints that allowed mobility were available, they would use them all or most of the time. However, nearly one-quarter (23%) reported they would rarely or never wear mobile restraints. Twenty-nine percent reported they would use a helmet with an integrated communications system all or most of the time, whereas 49% reported they would rarely or never use it.

Additionally, 26% of respondents reported that their defibrillator, which typically weighs 11–20 lbs., was rarely or never secured during patient transport (emergency or non-emergency). Sixty-three percent reported that the device was secured all or most of the time. Similarly, 9% of respondents reported that oxygen cylinders (weighing approximately 16 lbs.) were rarely or never secured; 84% reported the portable oxygen cylinder was secured all or most of the time.

Table 1: Survey Response Rates

	Universe	Sample	Respondents	Response Rate
EMT-Basics	165,168	3,247	854	26.3%
EMT-Paramedics	53,671	2,286	919	40.2%
<b>Totals</b>	<b>218,839</b>	<b>5,533</b>	<b>1,773</b>	<b>32.0%</b>

Case weights were calculated for respondents, reflecting the individual's probability of selection, and were adjusted for non-response. Results presented are based on the weighted data.

Only 12% of respondents reported using seat belts all or most of the time during emergency transports.

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## DISCUSSION

In 2002, EMS providers performed more than 7 million patient transports.<sup>3</sup> Because this estimate was based on data provided by only about half of the states, the actual number is presumably much higher. States not reporting EMS transports account for more than 73% of the nation's population. Thus, the number of exposures during patient transports for the EMS population is considerable.

More than two-thirds of the respondents reported transporting two or more patients simultaneously within the prior 12 months. To enable the transport of a second patient, a second stretcher must be secured to the squad bench, which runs along the length of the passenger (curb) side of the patient compartment. (Figure 1 illustrates a common layout for Type I and Type III ambulances.) When unoccupied, the squad bench position is the location from which a provider can provide the maximum amount of aid to a patient, with 78% of respondents reporting it as their usual seat during transport. When a second patient is on the squad bench, no seated position is available from which to provide controlled assessment or care to the second patient.

In a 1993 study of differential front and back seat safety belt use by prehospital care providers, EMS personnel most often attributed the lack of patient-compartment seat-belt use to inhibition of patient care and restriction of movement.<sup>4</sup> In this survey, only 12% of respondents reported using seat belts in the patient compartment all or most of the time during emergency transport.

However, if restraints allowing for mobility were available, more than half (55%) would use these restraints all or most of the time. This finding underscores the NIOSH recommendation that "ambulance manufacturers, EMS providers, and researchers should develop and evaluate occupant protection systems designed to provide crash protection for EMS workers and the mobility necessary to access patients and equipment within ambulance patient compartments."<sup>5</sup>

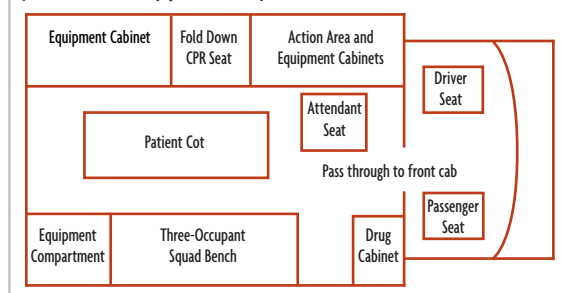
Radio communications systems are generally located in the front corner of the patient compartment opposite the squad bench (on the driver or street side) in most ambulances. This forces a provider seated on the squad bench to stand and move to access the system,

putting them at much greater risk than when seated and belted in place. However, nearly half (49%) would rarely or never use a helmet with integrated communications. This suggests that an alternative measure—which many ambulance manufacturers now offer to customers—is to relocate or install redundant radio controls to the curb-side area of the patient compartment within reach of a provider seated on the squad bench.

Unsecured equipment, such as defibrillators and oxygen cylinders, pose a significant injury hazard if launched as projectiles during a collision. For example, during a 30 mph collision between a typical Type III ambulance and a fixed object, such as a utility pole or bridge abutment, an unsecured 16-lb. oxygen cylinder generates approximately 480 lbs. of force.

The findings in this survey strongly correlate with those of other research. For example,

Figure 1: Ambulance Occupant Locations (Ambulance Types I & III)



a British study found that the side-facing seat in their ambulances (which corresponds to the squad bench position in U.S. ambulances) was used by paramedics to attend the patient 71% of the time.<sup>2</sup> The same study also observed that attending the patient from the side-facing position results in the paramedic having to sit forward or stand and, therefore, not use the seat belt.<sup>2</sup> In a Canadian study of 271 paramedics, a majority rated access to equipment while seated in the patient compartment as "Poor" (48%) or "Very Poor" (20%).<sup>6</sup>

The high exposure to vehicle crashes resulting from millions of annual transports makes it imperative that EMS providers remain protected while caring for patients during transport. These findings show a need for protection while working from the squad bench—and the willingness of providers to use better seating and equipment location, as well as mobile restraints in the patient compartment. Transporting more than one patient at a time and having unsecured equipment add to the risks of working in the patient

compartment. Further intervention testing and compartment redesign examinations are needed, as are studies identifying the barriers to the adoption of protective equipment by EMS crews. [JEMS](#)

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The findings and conclusions in this report are those of the author(s) and do not necessarily represent the views of the National Institute for Occupational Safety and Health or the American Institutes for Research.

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## SNAPSHOT SPECS

**Sample:** This study is based on a sample of EMTs and paramedics registered with the National Registry of EMTs (NREMT) as of September 2004. In 2004, the NREMT included 165,168 EMT-basics and 53,671 EMT-paramedics in the U.S. The sample size was 5,533, with 1,773 (32.0%) respondents.

**Instrument:** As part of the 2004 LEADS survey, an ambulance safety instrument was pilot tested on nine EMT-basics and EMT-paramedics, using a structured protocol. This protocol consisted of scripted probes that were administered after each item was answered, providing the interviewer with insights into whether the item was interpreted as intended, respondents had the information necessary to answer the question, respondents could easily formulate an accurate response and the response scales used were appropriate for the response task. As a result of this testing, three items were revised to enhance comprehension and an additional item was developed to provide important contextual information. Copies of the LEADS surveys are available at [www.nremt.org/about/lead\\_survey.asp](http://www.nremt.org/about/lead_survey.asp).

**Data collection:** Surveys were mailed out in November 2004 to the sampled EMTs and paramedics. A cover letter and postage-paid return envelope were included with the survey. After surveys were returned, they were optically scanned and used to create an analytic data file.

**Data analysis:** Data analysis was conducted using SAS System software, version 8. All results presented are weighted and generalizable to the universe of nationally registered EMT-basics and EMT-paramedics. A previous study showed that, outside of differences in certain demographic characteristics (such as age, experience and gender), few differences exist between the behaviors and attitudes of EMTs who are nationally registered and EMTs who are not nationally registered.<sup>1</sup> Further, previous studies have shown little evidence that non-responders to LEADS surveys differ from respondents with respect to attitudinal, behavioral and demographic items (other than income).<sup>2</sup> Limitations include a 32% response rate, absence of a non-response follow-up survey, exclusion of non-registered EMTs and paramedics, and the omission of providers employed in roles other than "Basic" or "Paramedic," such as "EMT-Intermediate" and "Cardiac Care."

## REFERENCES

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