Appendix

EMS Safety Websites
July 2010

Federal Emergency Medical Services for Children
http://bolivia.hrsa.gov/emsc/

NHTSA EMS
http://www.ems.gov/

EMS Safety Foundation
http://www.emssafetyfoundation.org/

Objective Safety
http://www.objectivesafety.net

Automotive Safety Program
http://www.preventinjury.org/research.asp

National Highway Traffic Safety Administration
http://www.nhtsa.gov

safe ride news™
Articles

Ambulance

A. Occupant Protection for Ambulance Passengers: An Overview (Nov/ Dec 2002)

Ambulances, revered for their role in saving lives, present risks to crew and patients that have attracted increased interest recently. This is due largely to the individual research efforts of Nadine Levick, M.D., an emergency physician at Harlem Hospital in New York City, and Marilyn Bull, M.D., a developmental pediatrician at Riley Children's Hospital, Indianapolis, Ind. Dr. Levick's work, supported in part by the PED-SAFE-T EMSC targeted issues grant, has been publicized through a number of recent papers and articles. Dr. Bull was awarded the "Out of Hospital Care Award" by the American Academy of Pediatrics Section on Emergency Medicine in October of this year.

Recently, the American Ambulance Association, which had been instrumental in supporting Dr. Levick's vehicle crash tests, established a special task force to address EMS transport safety issues. It is developing a clearinghouse of EMS transport safety information to be available via its web page. Meanwhile, more and more EMTs and medics are becoming trained in child passenger safety and aware of the problems of occupant protection for themselves and patients.

The problem

Ambulance crash data have recently revealed the risks for EMTs and paramedics as well as patients being transported by ambulance. There are an estimated 5000 ambulance crashes annually, causing approximately one fatality per week (25 percent to ambulance occupants, often EMTs or paramedics) and many serious injuries daily. Intersection crashes of ambulances, both frontal and lateral, are most commonly associated with serious injures.

Emergency vehicles are very different from passenger vehicles and have unique functions. Occupants sit facing in various directions and have specific actions to perform during transport. There are no safety standards for providing care in a moving ambulance, although such standards exist for air-ambulance transport. While an emergency physician at Johns Hopkins, Dr. Levick studied how a group of patients under age 14 were actually transported in ambulances. She found that 76 of 206 children (37 percent) were unrestrained on the bench or a person's lap. More than half were on the gurney, and over 10 percent of these were not restrained while others were using the one of the two sets of adult straps. (SRN, July/Aug. 2000)

Sled and crash tests of patient compartments

Dr. Levick's focus has been on the emergency vehicle as a system. She emphasizes that unless all occupants and equipment are properly restrained, risks are high to properly

restrained individuals. She conducted sled tests of the intact rear ambulance patient compartment with adult dummies and a restrained child dummy in 1999 (1,2).

In 2000, Levick ran vehicle-to-vehicle ambulance crashes with instrumented dummies in the patient compartment (3). Frontal and side impacts were used to show the effects of common real-world scenarios. A 3-year-old child dummy was secured in a convertible child restraint anchored to the gurney via two belt paths with the gurney back semi-upright at about 45 degrees. In addition, male and female adult dummies were in the patient compartment; one unrestrained in each test and the other two lap-belted. Two dummies were on a side-facing bench seat and the other in the rear-facing attendant's seat. Medical equipment was included make the environment as realistic as possible.

The dangers of unrestrained occupants and/or unrestrained equipment striking other occupants was demonstrated clearly in these tests. For example, the child dummy was struck head-first by a 80 kg (176 pound) dummy. Recommendations included increased vehicle padding and attendant head protection in addition to the use of restraints by all occupants and for all equipment. Data from these tests were used to develop crash pulses to be used in further testing.

Child restraint use modes tested

Over a number of years, Dr. Bull and her colleagues have conducted sled tests of various child restraints and isolettes on ambulance gurneys at the University of Michigan. The anchors for the gurneys failed in the early tests.

In the most recent tests (2000), redesigned gurney anchors performed significantly better. A convertible CR installed facing the rear and a Cosco Dream Ride car bed performed well (SRN, Sept./Oct. 2001) (4). Both restraints were secured using two belts that are standard equipment on gurneys. The Dream Ride Car Bed was positioned laterally and equipped with a second set of belt loops to enable belts to be attached on either side of it. In the convertible restraint, both an infant and a toddler would be positioned facing the rear.

Transporting children

EMS providers who are involved in child passenger safety as technicians and educators have many questions specifically about transporting children. In 1999, the Emergency Medical Services for Children (EMSC) Program of NHTSA and DHHS issued general guidelines for transporting children: Do's and Don'ts of Transporting Children in an Ambulance (SRN, Fall 1999). The guidelines were developed by a team led by Dr. Levick. They were intended to be interim guidelines pending the availability of more specific technical data and methods of anchoring child restraints such as those outlined in the recent publications by Drs. Bull and Levick. So far, it has not be updated.

There remain many questions about effective restraint designs and operational protocols for the crew. The most crucial and immediate take-home messages from the tests so far are:

- Ambulance drivers should use caution and avoid unnecessary speed.
- Restraints should be used by all occupants.
- All equipment should be fastened down securely.

SRN will publish a follow-up article on real-world activities to protect children in ambulances in an upcoming issue.

NOTE: Since the methods of anchoring CRs used by both Dr. Levick and Dr. Bull are unorthodox, manufacturers must be consulted before using their products in this way.

References

1) "Biomechanics of the patient Compartment of Ambulance Vehicles under crash conditions: Testing countermeasures to mitigate injury," Levick NR, Li G, Yannaccone J, Society of Automotive Engineers Technical Paper 2001-01-1173; www.sae.org/servlets/index (search by paper number)

2) "Development of a dynamic testing procedure to assess crashworthiness of the rear patient compartment of ambulance vehicles," Levick NR, Li G, Yannaccone J, Enhanced Safety of Vehicles Technical Paper # 454, May 2001.

3) "Ambulance crashworthiness and occupant dynamics in vehicle-to-vehicle crash tests: Preliminary report," Levick NR, Donnelly BR, Blatt A, et al. Enhanced Safety of Vehicles, Technical Paper # 452, May 2001

4) "Crash Protection for Children in Ambulances," Bull, MJ, Weber, K, Talty, J, Manary, M, 45th Annual Proceedings, Assoc. for the Advancement of Automotive Medicine, 2001; http://www.carseat.org/Resources/Bull_Ambulance.pdf

B. Protecting Children in Ambulances: Real World Practices (Jan / Feb 2003)

EMS providers in the U.S. transport approximately 6 million children every year, with an average of 1000 critically injured and 5000 critically ill children transported daily. An in-depth report on ambulance safety that appeared in the Detroit News recently explores many deficiencies in safety for EMTs and medics, patients, and other motorists involved in ambulance crashes. (1) Safe Ride News continues to explore issues related to safe transportation of children in ambulances with a discussion of current practices and training. Research on this topic was discussed in detail in the SRN November/December 2002 issue. (see article above)

Assessing the Child's Medical Condition

When discussing ambulance transportation of children, basic patient care questions must be addressed in order to determine the most appropriate restraint options. Questions include: Do the child's injuries require immobilization? What level of pre-hospital care is required? Would the child's condition be improved or made worse by moving him or her from the child restraint to another restraint in the ambulance? Is the child in respiratory or cardiac distress? In the case of inter-hospital transportation, can advance planning assure that accommodations are made for optimal restraint use?

Restraining Child Passengers

Traditionally, emergency medical technicians (EMTs) were taught to restrain passengers, including infants and children, on ambulance cots using existing belt systems. Training also allowed children to be transported in a parent/caregiver's arms or lap with

the adult sitting on a stretcher.

NHTSA's four national standard EMS curricula and most state and local emergency service agencies require that children in ambulances be transported in the most appropriate manner for their condition. These policies do not define "appropriate transport."

In 1999, the Emergency Medical Servic es for Children (EMSC) issued helpful but very general guidelines for children in ambulances (see box, below).

Policy makers seeking to define policies and procedures for the most appropriate and effective restraint systems for child ambulance passengers can turn to recently conducted research for guidance. (SRN, Jan/Feb 2003) Research conducted in 2000 by Dr. Nadine Levick clearly demonstrates the fact that a child's safety (indeed, any passenger's safety) can be severely compromised if other passengers and objects in the ambulance rear compartment are not restrained.(3)

In 2001, Marilyn Bull, M.D, Kathleen Weber, Judith Talty, and Miriam Manary presented research findings showing the superior performance in an ambulance environment of a convertible child restraint and a car bed over a harness system.(4) Their paper also summarized similar tests they had run in the early 1990s of child restraints installed on gurneys that had showed failure of gurneys anchorages. Some new products (such as the Ferno Stat Trac system) have redesigned crashworthy anchorages. The complete report is available at www.preventinjury.org/research.asp.

Ambulance transportation procedures in line with Dr. Bull's recommendations are currently being implemented in agencies across the country, including Dr. Bull's home base, the Riley Hospital for Children in Indianapolis, IN. Dr. Bull says, "The methods of attachment we have developed and described have generated intense interest and can be implemented in many, though not all, ambulances and cot environments.

Many issues regarding safe transportation of all occupants in the ambulance are not solved, but these procedures provide initial steps that are effective for some passengers and which can be refined and enhanced with future research."

When asked about the use of these child restraint installation procedures on older, less well-anchored gurneys, both Dr. Bull and Kathleen Weber agreed that, even if a gurney were to collapse in a severe crash, a child restrained in an appropriate manner would be better off than if unrestrained or improperly restrained

Current Practice

According to several practicing EMTs, many emergency responders continue to transport children on ambulance gurneys (cots or stretchers) using only existing belt systems, allow children to ride held in an adult's lap, or use harness restraints. Some innovative services are now routinely utilizing child safety seats (ambulance-specific and those designed for use in private vehicles) for children who do not need to be immobilized. These practices are based on the research described above but are not sanctioned by current national training curricula (see related article). Manufacturers should be consulted for amended instructions when using child restraints in a manner other than generally recommended.

Christy McKendrew, NREMT-P, CPS Instructor with the Emergency Providers Inc. in Kansas City, Mo., became aware of the inadequacy of traditional child emergency transport practices in 1999 when she was trained as a certified Child Passenger Safety

Technician. After approaching management at her service about these concerns, she was asked to recommend alternatives. Christy reviewed an inflatable child restraint system, a hard foam seat, and a convertible child restraint (Cosco Touriva). The Clinical Upgrade Committee at her service agreed with her recommendation to use the Touriva convertible seat. “Cost and age/size range were the big factors as well as the fact that we could fit them in several places on the ambulance for storage,” according to McKendrew who taught more than 400 field employees to use the seats during annual mandatory in-service trainings. Her service now trains newly hired people to use the safety seats through field training officers. Christy reports, “There was the usual resistance to something new and I got a lot of questions the first few weeks, but the seats seem to be working out very well now.”

Eric Morrison, a paramedic who is a CPS Instructor and the Community Relations Coordinator for the Mecklenburg EMS Agency in Charlotte, NC, reports that his agency uses the Pedi-Pal by Ferno-Washington, Inc., a metal convertible safety seat designed for emergency transport of children weighing up to 40lbs. “Although the Pedi-Pal requires assembly, our agency selected this seat because it can be folded for storage” says Eric Morrison.

A common practice in the EMT community is to transport children who are not in cardiac or respiratory distress in their own safety seats in order to immobilize the child if there is a concerrn about spinal damage. This is the preferred practice at the Children’s Hospital of Winnipeg in Manitoba, Canada, according to Janice Beckles, a surgical nurse clinician at the hospital.

Although a seat involved in a crash would no longer be considered crashworthy according to CPS guidelines, Kathleen Weber, who developed the two-belt installation system and conducted the tests for the 2001 study by Bull, et al, notes that, “Under post-crash circumstances, it may be necessary to temporarily violate the best practice of not using a child restraint that has been in a crash. However, such a child restraint, if still intact, will provide far superior restraint for the child than the stretcher alternative.” The belt system of a typical gurney provides poor restraint for a patient either lying flat or with the back elevated. Even if the shoulder straps were used, explains Weber, the straps are routed over the top of the gurney, not close to the shoulders, giving the patient plenty of space in which to ramp up the back. A small occupant would be likely to slide out head first in a frontal collision, as has happened in actual crashes.

Another option is the use of a child safety seat integrated into a rear-facing captain’s chair in the front of the ambulance patient compartment. There is an integrated restraint that can be used to transport uninjured children older than one year and weighing between 20 and 50 pounds. Alternatively, the seat can be used for adult passengers or emergency personnel as needed. Dr Levick is concerned about placing a child in this seating position if other occupants and equipment are not securely restrained, due to the risk of further injury in a frontal crash. Whenever possible, an uninjured child should be transported in another vehicle.

Unanswered questions

Some concerns raised over the years regarding the use of child restraints in ambulances are not yet resolved, including:

• in the case of crash victims, employing a CR that has been in use in a crash vs.

transferring the child to an appropriate CR carried in the ambulance.

• in the case of crash victims, how to handle children in CRs other than convertible models who have injuries that could be aggravated by moving them to another device.

• validation of ambulance-specific test procedures for CRs.

• using the convertible CR contrary to manufacturer's instructions by installing it on a gurney, using two belt paths at the same time, and using it rear-facing up to 40 pounds, despite the fact that such practices could improve rather than degrade performance.

• not all gurneys have the latest, strongest anchorages to the vehicle floor.

Conclusion

In coming years, leadership from CPS-minded professionals in the EMS community and premiere EMS services across the nation will be critical in setting innovative and effective policies and procedures locally and nationally to insure that children are transported in ambulances in the safest, most appropriate manner possible.

—Janet Dewey-Kollen

1) "Unsafe Saviors," Lisa Zagaroli, *Detroit News*, Jan. 26–27, 2003, www.detnews.com/specialreports/2003/ambulance/index.htm
2) "Do's and Don'ts of Transporting Children in an Ambulance," Emergency Medical Services for Children Program, 1999, SRN, Fall, 1999,this issue is no longer posted on our web site, please contact nancy@saferidenews.com, and EMSC National Resource Center, www.ems-c.org
3) "A Crisis in Ambulance Safety," Levick NR, Emergency Response and Disaster Management, 20-22:4;2002
4) "Crash Protection for Children in Ambulances," Bull, MJ, Weber, K, Talty, J, Manary, M, 45th Annual Proceedings, Assoc. for the Advancement of Automotive Medicine, 2001, at www.carseat.org/Resources/Bull_Ambulance.pdf or www.preventinjury.org/research.asp

EMSC Do's and Don'ts of Transporting Children in an Ambulance,
(Excerpts from number 2 above.)
Practices suggested:
Do drive cautiously, at safe speeds.
Do ensure available restraint systems are used by EMTs and other occupants, including the patient.
Do not have the child/infant held in the parent's, caregiver's, or EMT's arms during transport.
Do transport children who are not patients properly restrained in an alternative vehicle, whenever possible.
Do tightly secure all equipment.

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NIOSH
Fire Fighter Fatality Investigation
and Prevention Program

Death in the line of duty...

A summary of a NIOSH fire fighter fatality investigation May 31, 2005

Career Fire Fighter/Emergency Medical Technician Dies and Paramedic is Injured in a Three-Vehicle Collision - Nebraska

SUMMARY

On August 6, 2003, a 43-year-old career fire fighter/emergency medical technician [the victim] died after the ambulance he was driving was struck from behind and pushed into a straight truck. The victim and a lieutenant/paramedic were conducting a non-emergency transport between two hospitals. The ambulance was traveling through a highway workzone and as the ambulance driver slowed down to move around a line painting crew, a tractor semi-trailer struck the rear of the ambulance and pushed it into the straight truck (Photo 1). Although the victim was using the vehicle occupant restraint, the front cab sustained such extensive damage that he was fatally injured. The lieutenant/paramedic and a patient, who had been riding in the ambulance patient compartment, were also injured during the collision.

NIOSH investigators concluded that to help prevent similar incidents:

- ***state department of highways and highway construction companies should consider the use of signs and warnings supplemental to those specified by the Manual on Uniform Traffic Control Devices (MUTCD) when conducting mobile operations (such as line painting)***
- ***trucking companies should train drivers to maintain safe following distances and to be aware of work zone hazards and slowing traffic***

Fire departments and emergency medical service (EMS) providers should:

- ***ensure that EMS workers use the patient compartment vehicle occupant restraints whenever possible***
- ***consider using shoulder straps with occupant restraints on patient cots to limit the movement of the patient from the cot during a vehicle crash.***

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.***

Photo1. Ambulance was pushed into rear of straight truck during the crash.

The **Fire Fighter Fatality Investigation and Prevention Program** is conducted by the National Institute for Occupational Safety and Health (NIOSH). The purpose of the program is to determine factors that cause or contribute to fire fighter deaths suffered in the line of duty. Identification of causal and contributing factors enable researchers and safety specialists to develop strategies for preventing future similar incidents. The program does not seek to determine fault or place blame on fire departments or individual fire fighters. To request additional copies of this report (specify the case number shown in the shield above), other fatality investigation reports, or further information, visit the Program Website at **www.cdc.gov/niosh/firehome.html** or call toll free **1-800-35-NIOSH**

Career Fire Fighter/Emergency Medical Technician Dies and Paramedic is Injured in a Three-Vehicle Collision - Nebraska

INTRODUCTION

On August 6, 2003, a 43-year-old male career fire fighter/emergency medical technician (EMT) died and a 47-year-old paramedic was injured when their ambulance was struck by a tractor semi-trailer and pushed into the back of a straight truck. On August 8, 2003, the U.S. Fire Administration (USFA) notified the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research of this incident. On October 15, 2003, a Safety and Occupational Health Specialist and a Safety Engineer investigated the incident. The NIOSH team interviewed the Chief and members of the department. They reviewed standard operating guidelines (SOGs), fire department photographs, reports from the Nebraska State Patrol and the County Sheriff, training records of the victim, the death certificate, and data from the 2003 Fatality Analysis Reporting System (FARS) data base.

Background The combination department is comprised of 39 career and 36 volunteer fire fighter/EMTs, and serves a population of approximately 35,000 in an area of about 370 square miles. The department has three fire stations.

Equipment The vehicle involved in this incident was a 2002 Type III[a] ambulance with a 159-inch wheelbase and 168-inch patient compartment. It was powered by a 7.3 liter turbo-diesel engine and automatic transmission. The gross vehicle weight listed for the vehicle was 14,050 pounds: 4,600 pounds for the front axle and 9,450 pounds for the rear. Actual weight of the vehicle at the time of the crash could not be established. It was equipped with an anti-lock braking system and three-point lap and shoulder seat belts for the front seat occupants. The patient compartment of the ambulance was configured with five seating positions, each equipped with two-point lap belt-type restraints. (Diagram 1) These positions included a rear-facing high-backed attendant's seat, a squad bench with accommodation for three occupants, and a fold-down CPR seat. Up-to-date ambulance maintenance and inspection logs were maintained by the department.

Other Vehicles Involved in Crash

The vehicle that hit the rear of the ambulance was a tractor semi-trailer combination, consisting of a 2000 model year, three-axle conventional cab tractor with a 50-foot semi-trailer. (Photo 2) After the incident, the tractor semi-trailer weighed 79,300 pounds. This vehicle was being operated by a 46 year-old driver who possessed a valid Commercial Driver's License. Investigators were not able to determine his experience or training history. No vehicle defects for this vehicle were noted by the police investigators.

The vehicle that the ambulance was pushed into was a 1998 two-axle straight truck chassis mounted with a cargo van body; it weighed 30,300 pounds. Police investigators noted no defects for this vehicle.

Street Conditions/Weather The ambulance was traveling east on an interstate divided highway comprised of two eastbound and two westbound lanes with paved shoulders. The weather was clear and sunny and the road surface was dry. The section of highway was located within a 14-mile repaving project that was nearly complete. The road surface was new asphalt. A mobile line painting crew was operating within the project area. The western approach to the project was marked according to the Manual on Uniform Traffic Control Devices (MUTCD)[1] with permanent signs indicating a 75 mph maximum speed limit, road work for the next 14 miles, and the doubling of fines for exceeding the speed limit. Temporary traffic control devices including speed limit reduction signs were posted within the project area depending on the type and location of the construction operation. On the day of the incident, a message board sign was in place at the beginning of the project area advising motorists of a left lane closure, to use caution, and that slow traffic was possible. At the time of the incident, the mobile operation was a little over 7 miles from the western start of the project. The mobile operation which included a working vehicle and three shadow vehicles at 1000-foot intervals, was set-up as depicted in Diagram 2 and conformed to the MUTCD specifications for mobile operation

[a] A Type lll ambulance is a cutaway van chassis with integrated modular patient compartment.

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on multi-lane high-speed roadways. The rearmost shadow vehicle was being driven on the left hand shoulder of the roadway and was equipped with two rear-mounted high intensity flashing lights and a changeable message sign that alternately flashed "ROAD WORK AHEAD" and "LEFT LANE CLOSED." The second shadow vehicle was driven straddling the roadway edge line and was equipped with two rear-mounted high intensity flashing lights and a flashing arrow sign indicating "merge right." A third shadow vehicle, being driven directly behind the working vehicle, was equipped with 2 rear-mounted flashing high intensity lights and a flashing arrow sign indicating "merge right". The working vehicle was equipped with two rear-mounted high intensity flashing lights.

Training and Certifications The department requires all career staff to be trained and certified as both a fire fighter and an emergency medical technician (EMT). The victim was a career fire fighter and had completed the department fire fighter training requirements, including National Fire Protection Association (NFPA) Fire Fighter Level I and he was a certified EMT-B (basic). As a State requirement, he had completed 30 hours of continuing education units every three years to maintain his EMT-B certification. The fire department requires a driver to train over a six-month period and requires a driver training rotation on all of the department's vehicles. The victim had attended a two-hour defensive driving class in 2002, and had a valid driver's license, which is required by the State to drive fire apparatus. There are no additional State licensing prerequisites for ambulance drivers. The victim had been working as a fire fighter/EMT for eighteen years and had been with the department the entire time.

The lieutenant/paramedic attending to the patient who was injured at the time of the incident was a career fire fighter and certified EMT-P (paramedic). He had completed department fire fighter training requirements and the state-required 60 hours of continuing education units every three years to maintain his EMT-P certification. He had been with the department for 18 years at the time of the incident.

INVESTIGATION

On August 6, 2003, a call was received at the fire department from the local hospital requesting an ambulance for a non-emergency patient transport to another hospital located approximately 230 miles away. Due to the long distance of the transport, the hospital also requested a paramedic to provide patient care. The duty officer of the fire department paged the victim and the lieutenant/paramedic, who were both off-duty, to report to the station for a transport. The ambulance arrived at the hospital at 1300 hours. At 1319, the ambulance departed from the hospital with the victim driving and the lieutenant/paramedic attending to the patient. The emergency lights and siren were not activated because this was a non-emergency transport.

During the transport, the lieutenant/paramedic was positioned in the rear-facing attendant's seat, moving to the bench seat every hour to check the patient's vital signs. The patient was positioned on the cot with his head elevated and with the cot safety straps fastened across his chest, pelvis, and legs.

At 1605 hours, while traveling eastbound in the left lane, the ambulance approached the mobile operation engaged in painting lines on the road. Meanwhile, the patient had asked to borrow the lieutenant/paramedic's mobile telephone. The lieutenant/paramedic unbuckled his seat belt, moved over and sat on the squad bench, and handed his phone to the patient. The patient dialed the phone and talked, while the lieutenant/paramedic returned to the attendant's seat. As the lieutenant/paramedic was sitting down in the seat he observed through the rear windows of the ambulance a tractor with a semi-trailer quickly approaching. The ambulance had slowed or nearly stopped as it approached the line painting crew and the tractor semi-trailer struck it in the rear. The tractor semi-trailer driver applied the brakes and steered left and the tractor semi-trailer came to a stop with its left wheels on the left shoulder of the road. (Diagram 3) The ambulance which may have been been steering right to merge was pushed approximately 240 feet until it collided with the rear of a straight truck traveling in the right lane. The ambulance and

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straight truck came to rest on the right shoulder of the road. The collision forces crushed the front of the ambulance and pushed its engine back into the cab (Photo 3). The State Patrol investigators estimated the tractor semi-trailer's speed at 61 mph at the time the driver applied the brakes.

During the collision, the lieutenant/paramedic, in the process of regaining his position on the attendant's seat, slipped off the curb side seat edge and continued moving toward the driver's cab. As he did so, he felt his thigh strike the patient-cot. His next memory was that of being wedged in the pass-through to the front cab and lying on top of the patient, who had been ejected from the cot. The patient told the lieutenant/paramedic that because he was laying on top of him, he could not breathe. However the lieutenant/paramedic could not move. A fire had started under the ambulance and according to the lieutenant/paramedic, it was dark and smoky inside the ambulance. A passing motorist stopped to assist. He used a fire extinguisher from one of the crashed trucks to put out the fire. Light entered the ambulance when a motorist and two off-duty EMTs who had been traveling westbound observed the collision, opened the door of the ambulance, and began to remove the patient and the lieutenant/paramedic. Several fire departments responded to the incident and upon arriving at the scene made an assessment of the situation. They decided that the extent of the lieutenant/paramedic's injuries necessitated that he should be life-flighted to a hospital located 20 miles away from the incident. The patient was transported to the same hospital by a fire department ground ambulance. After the lieutenant/paramedic and the patient had been transported from the scene, several fire department members extricated the victim from the front seat area. The victim was transported to the hospital and pronounced dead at 1657 hours. Although the victim was using the vehicle occupant restraint, the front cab sustained such extensive damage that he was fatally injured. The lieutenant/paramedic suffered several fractures and lacerations. He spent one week in the hospital intensive care unit and an additional five weeks in a rehabilitation facility. The patient suffered no serious injuries.

The physical evidence gathered by the state police investigators indicate that the tractor semi-trailer collided with the ambulance only 2 feet beyond the point at which the semi-trailer's wheels had been braked to the point of skidding. This suggests that the tractor semi-trailer driver's attention may have been distracted from driving, or he significantly misjudged either the rate he was overtaking the ambulance, the distance between the ambulance and the tractor semi-trailer, or the braking capacity of the tractor semi-trailer. The police report indicates that the tractor semi-trailer driver was cited for following too closely.

CAUSE OF DEATH

The death certificate listed the cause of death as blunt force trauma due to a motor vehicle accident.

RECOMMENDATIONS

Recommendation #1: State department of highways and highway construction companies should consider the use of signs and warnings supplemental to those specified by the Manual on Uniform Traffic Control Devices (MUTCD) when conducting mobile operations (such as line painting).

Discussion: It could not be ascertained whether the tractor semi-trailer driver was aware that he was approaching a mobile work operation and that traffic in front of him would be slowing and merging right. Nor could it be determined if he knew the ambulance was moving slower than his truck. The distance between the point of the tractor semi-trailer collision with the ambulance and the mobile work operation is not known. As previously noted, the western approach to the project was marked with traffic control signs and warnings that conformed to the specifications of the MUTCD. However, within the 7¼ mile distance from the start of the project to the incident site, no other temporary traffic control signs were posted. A vehicle traveling at the posted maximum 75 mph limit would require about 5½ minutes to travel this distance. Also, the signage at the western approach indicated a left lane closure, but did not include information to tell drivers that the closure was due to a mobile operation

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whose location was continually changing. While the set-up of both the stationary and the mobile traffic control signs conformed to the MUTCD specifications, additional warnings located within the project area could be used to remind motorists that they were still traveling in an active work zone. This information could warn motorists that the work operations were moving and could be encountered at any time while traversing the 14-mile project area. Message board signs could be used to flash warnings that are more descriptive of the operation being conducted, such as "MOBILE OPERATIONS AHEAD", "SLOW MOVING TRAFFIC" or "LINE PAINTING IN PROGRESS." These measures could guard against motorists becoming desensitized to the existence of work zone hazards after they have traveled in a designated work zone for several miles without encountering work operations.

Recommendation #2: Trucking companies should train drivers to maintain safe following distances and to be aware of work zone hazards and slowing traffic.

Discussion: A National Transportation Safety Board Safety Recommendation of May 25, 2001, reported that of 1,923 fatalities occurring as a result of rear-end collisions in 1999, 770 involved commercial vehicles (trucks weighing more than 10,000 pounds and motor coaches).[2] This represented 40% of the fatal crashes even though commercial vehicles only accounted for 3% of the vehicles. In work zones, commercial vehicles were involved in 62% of the fatal rear-end crashes.

Results of a police reconstruction estimated that the tractor semi-trailer was traveling at a minimum speed of 61 mph when its wheels started to skid. Given that the posted speed limit was 75 mph, the tractor semi-trailer driver may have been slowing as he approached the ambulance. However, the physical evidence reported by the police reconstruction also indicates that the semi-trailer collided with the ambulance only 2 feet beyond the point at which the tractor semi-trailer's wheels began to skid. This suggests that the tractor semi-trailer driver's attention may have been distracted or he may have significantly misjudged either the rate he was overtaking the ambulance, the distance between the ambulance and the tractor semi-trailer, or the braking capacity of the tractor semi-trailer. Maintaining safe following distance allows motorists time to adjust to traffic speed and provides sufficient distance for safe stopping and collision avoidance. The rule-of-thumb for safe following distance is one second of space for each 10 feet of vehicle length at speeds below 40 mph. At speeds over 40 mph, add one second.[3] For example, a safe distance for the 75-foot long tractor semi-trailer in this incident at speeds over 40 mph would be 8 seconds. If additional space between the ambulance and the tractor semi-trailer had been available, the driver may have been able to slow down or steer away from the collision.

Recommendation #3: Fire departments should ensure that EMS workers use the patient compartment vehicle occupant restraints whenever possible.

Discussion: The patient compartment of the ambulance involved in this incident was configured with five seating positions, each equipped with two-point lap belt-type restraints. The department's written policies required all occupants of the ambulance to wear the lap-belt occupant restraints while the ambulance was in motion unless they interfered with personnel providing patient care. According to the lieutenant /paramedic, he had ridden restrained in the attendant's seat for the entire trip except when he had moved to the squad bench to check the patient's vital signs and hand him the cell phone. He was in the process of resuming his restrained position in the attendant's seat (Photo 4) when the collision occurred. It should be noted that the lap-belt restraint systems commonly used in ambulances may not allow full access to the patient during treatment for all conditions. For example, when properly used, the squad bench lap belt positions the occupant against the side wall in such a manner that the EMT may not be able to bend forward far enough to access the patient and check vital signs. If the EMT needs to access

the cabinets along the opposite wall, the lap-belt must be unbuckled to allow the EMT to stand up. Additionally, if it is necessary to perform CPR or other procedures, such as intubations or insertion of IVs, it may be necessary for the EMT to unbuckle the lap-belt to stand over or kneel at the side of the cot.

Recommendation #4: Fire departments and emergency medical service providers should consider using shoulder straps with occupant restraints on patient cots to limit the movement of the patient from the cot during a vehicle crash.[5]

Discussion: Although not seriously injured during the collision, the patient was ejected from the cot and came to rest on the patient compartment floor, wedged in the pass-through and underneath the lieutenant/paramedic. Cots used by the department were equipped with occupant restraints that consisted of safety straps for the patient's chest, abdomen, pelvis, and legs, but did not have shoulder straps. As this incident shows, safety straps across the patient's body offer little resistance to forward movement induced from collisions. A patient ejected from the cot during a head-on collision is at risk of injury from impacts with the patient compartment bulkhead or an occupant seated in the attendant's seat. Other patient compartment occupants are at risk of injury if an ejected patient collides with them during a crash.

Recommendation #5: 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.[5]

Discussion: Currently, ambulance patient compartments are equipped with two-point lap-belt occupant restraints. As previously noted, proper use of these restraints precludes EMS worker mobility in the patient compartment and access to the patient for procedures such as CPR. In a 2003 study of the relative risk for injury in emergency vehicles, over half of the ambulance occupant fatalities occurred to unrestrained patient compartment occupants and unrestrained patient compartment occupants accounted for nearly half of the incapacitating injuries.[6] Harness-type restraint systems that afford user mobility are commonly used in military aircraft and civilian air ambulances. Similar systems that allow mobility for workers have been designed for ground ambulances and have been used on a limited scale.[4] These systems employ retractor-equipped tethers to connect a harness worn by the EMT to strategic locations on the vehicle structure. The retractor allows occupant mobility by winding the tether on or off of a reel. In a vehicle crash, the retractor automatically locks the reel to limit occupant motion. Although their ground vehicle crash performance and user acceptability has not been fully tested and evaluated, these systems may have potential for improving the crash survivability of workers in ambulance compartments.

REFERENCE:

1. FHWA [2000]. Manual on Uniform Traffic Control Devices Millennium Edition. Washington D.C: U.S. Department of Transportation, Federal Highway Administration.

2. National Transportation Safety Board Safety Recommendation, H-01-06 through -08. Washington D.C: National Transportation Safety Board, May 2001.

3. Byrnes M and Associates [2004]. How to Prepare for the CDL Commercial Drivers License Truck Driver's Test, 2nd Edition. Hauppauge, NY: Barron's Educational Series, Inc.

4. Spival M [1998]. Buckle up! Kicker vest attendant restraint system protects providers. Emergency Medical Services, 27(11):47-49.

5. CDC [2003]. Ambulance Crash-Related Injuries Among Emergency Medical Services Workers – United States, 1991 – 2002. Morbidity and Mortality Weekly Report, Vol. 52, No. 8: 154-156.

6. Becker LR, Zaloshnja E, Levick N, LI G, Miller TR [2003]. Relative Risk of Injury and Death in Ambulances and Other Emergency Vehicles. Accident Analysis and Prevention 35: 941-948.

INVESTIGATOR INFORMATION

This incident was investigated by Nancy T. Romano, Safety and Occupational Health Specialist and Paul Moore, Safety Engineer, NIOSH, Division of Safety Research, Surveillance and Field Investigations Branch

Career Fire Fighter/Emergency Medical Technician Dies and Paramedic is Injured in a Three-Vehicle Collision - Nebraska

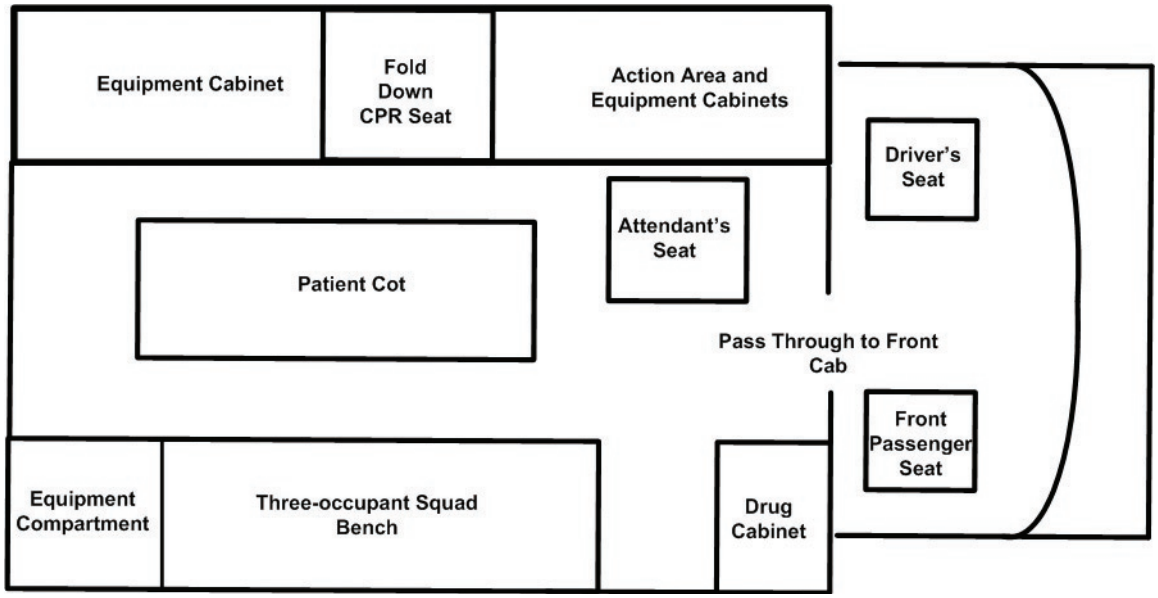

Diagram 1. Patient compartment and front seat layout of ambulance

Photo 2. 2000 conventional cab tractor after collision

Career Fire Fighter/Emergency Medical Technician Dies and Paramedic is Injured in a Three-Vehicle Collision - Nebraska

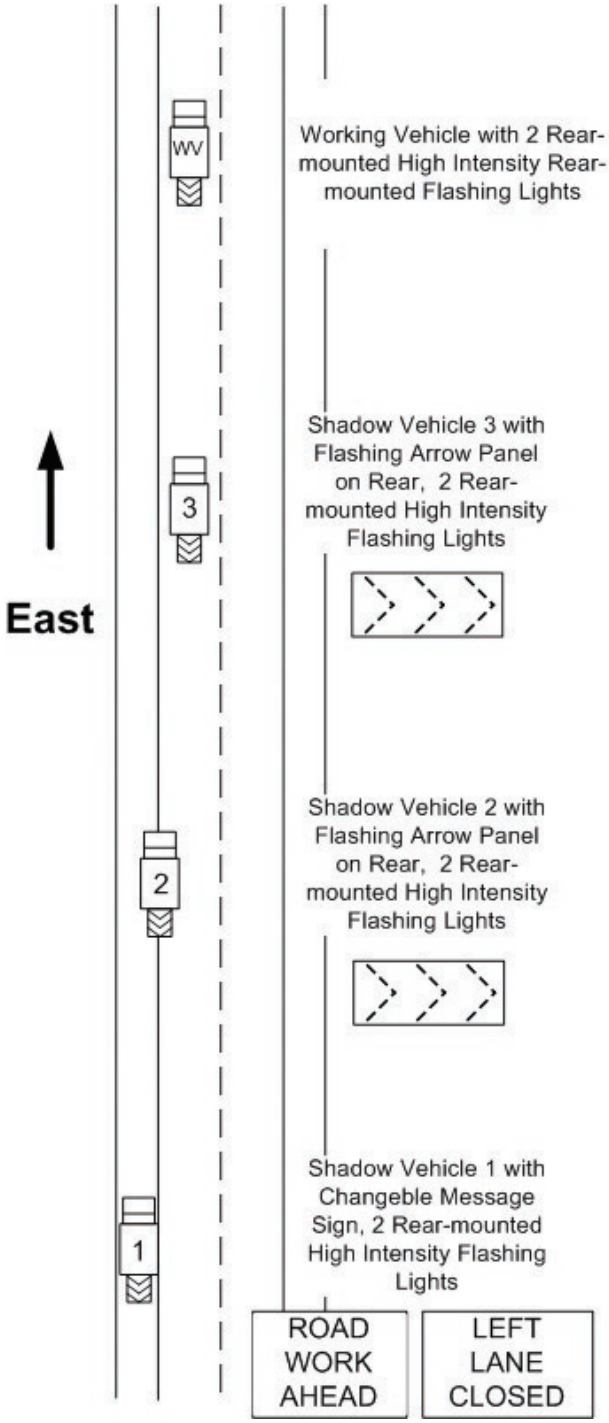

Diagram 2. Mobile operation set-up

Career Fire Fighter/Emergency Medical Technician Dies and Paramedic is Injured in a Three-Vehicle Collision - Nebraska

Photo 3. Front cab of ambulance after collision

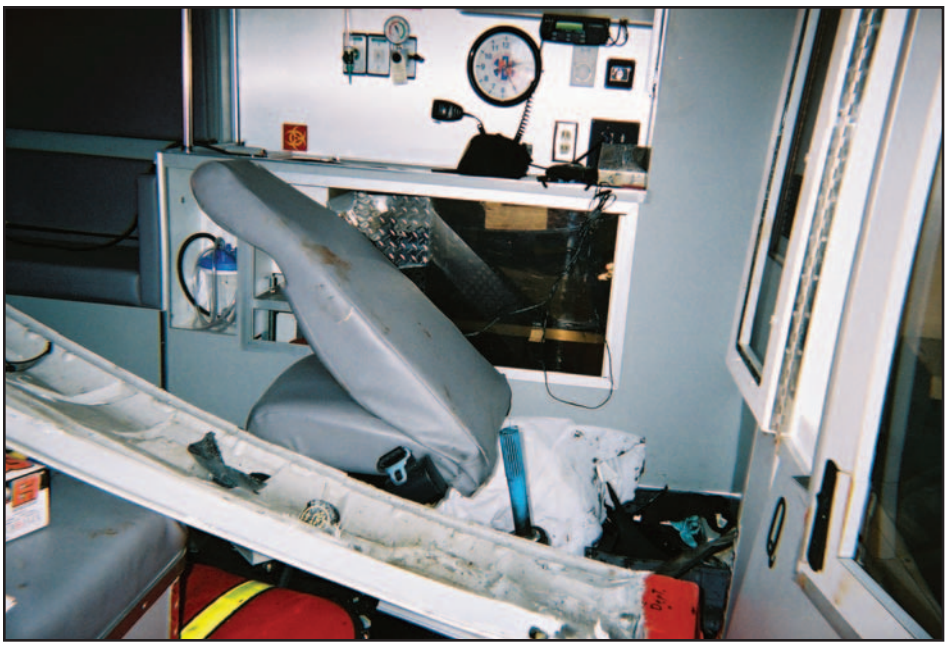

Photo 4. Attendant's seat after crash; note intrusion of drive shaft into compartment

Career Fire Fighter/Emergency Medical Technician Dies and Paramedic is Injured in a Three-Vehicle Collision - Nebraska

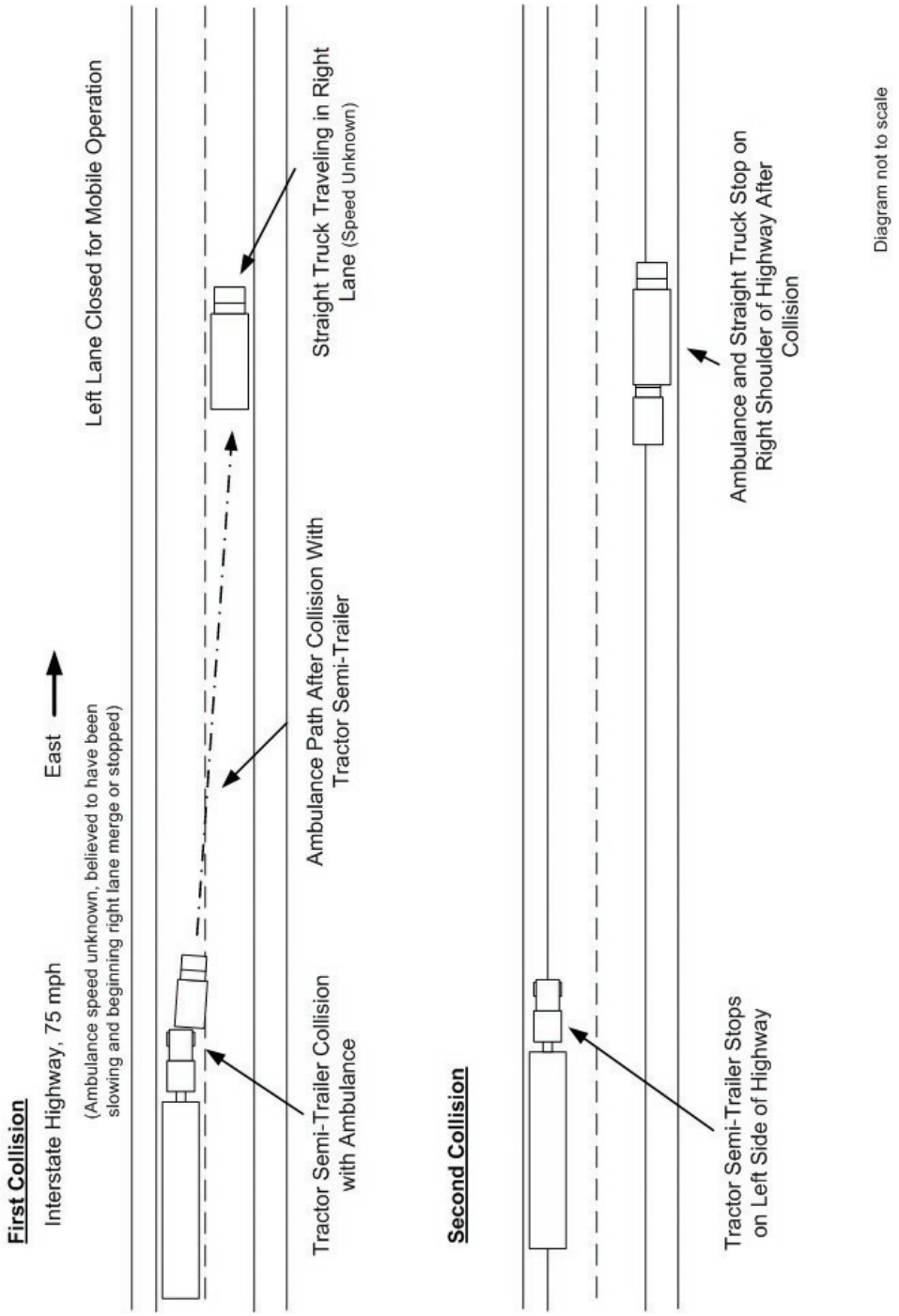

Diagram 3. Path of Ambulance

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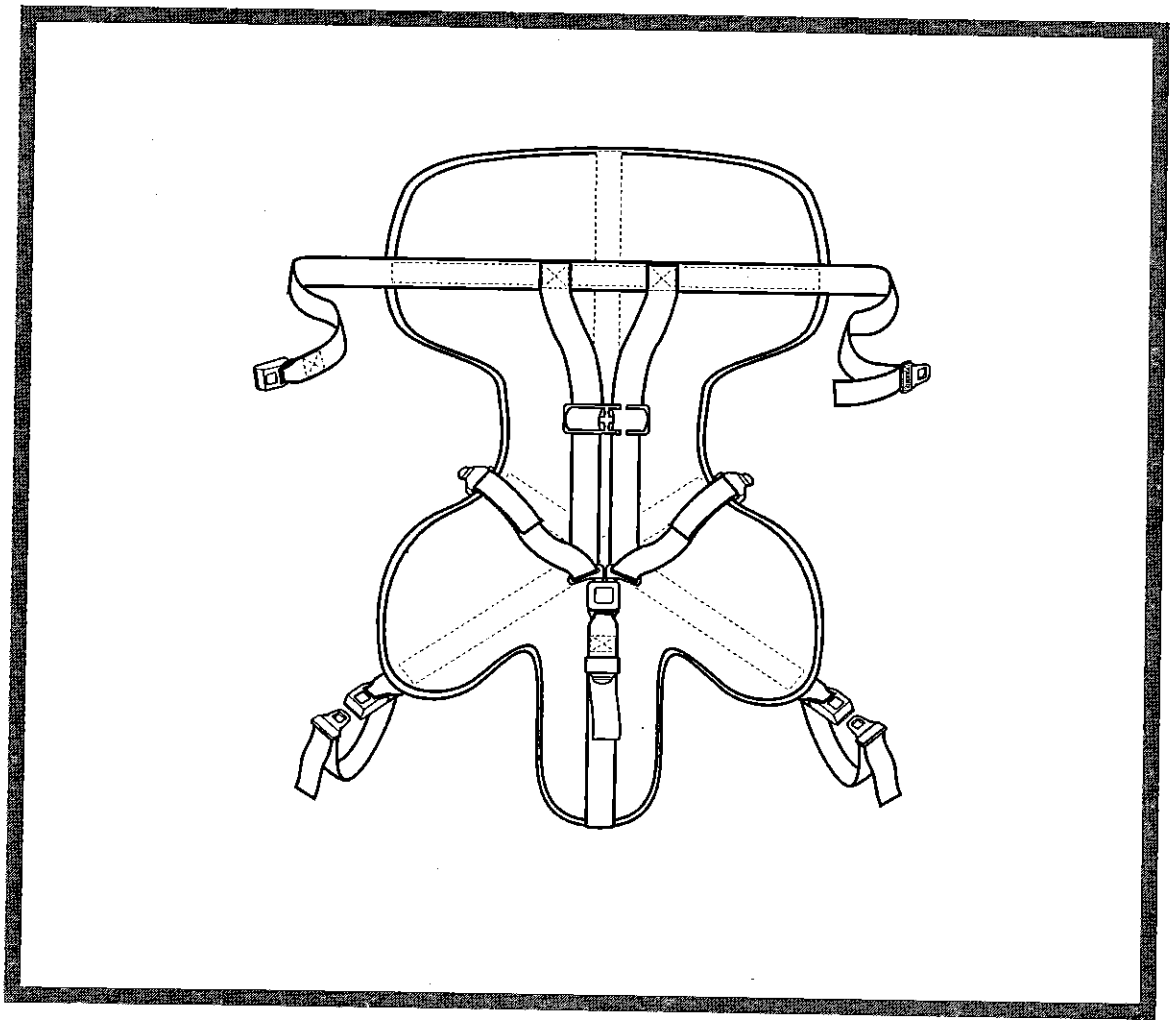
Users' Manual



Model 678
Pedi-Mate®

September 2006 GLO

Pub. No. 234-2045-02

Disclaimer

This manual contains general instructions for the use, operation and care of this product. The instructions are not all-inclusive. Safe and proper use of this product is solely at the discretion of the user. Safety information is included as a service to the user. All other safety measures taken by the user should be within and under consideration of applicable regulations. It is recommended that training on the proper use of this product be provided before using this product in an actual situation.

Retain this manual for future reference. Include it with the product in the event of transfer to new users. Additional free copies are available upon request from Customer Relations.

Proprietary Notice

The information disclosed in this manual is the property of Ferno-Washington, Inc., Wilmington, Ohio, USA. Ferno-Washington, Inc. reserves all patent rights, proprietary design rights, manufacturing rights, reproduction use rights, and sales use rights thereto, and to any article disclosed therein except to the extent those rights are expressly granted to others or where not applicable to vendor proprietary parts.

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Fax ..... +1.937.382.6569
Internet ..... www.ferno.com

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Illustrations

1 - SAFETY INFORMATION

1.1 Warning

Warning notices indicate a potentially hazardous situation which, if not avoided, could result in injury or death.

⚠ WARNING

Untrained operators can cause injury or be injured. Permit only trained personnel to apply the Pedi-Mate.

Improper use of the Pedi-Mate can cause injury. Use the Pedi-Mate only for the purpose described in this manual.

Improper application can cause injury. Apply the Pedi-Mate only as described in this manual.

An unattended patient can be injured. Stay with the patient at all times.

Secure and snug all straps.. Unsecured or loose straps may allow movement and result in injury or death of the patient.

Improper maintenance can cause injury. Maintain the Pedi-Mate only as described in this manual.

Modifying the Pedi-Mate can cause injury and damage. Use the Pedi-Mate only as designed by Ferno.

1.2 Important

Important notices emphasize important usage or maintenance information.

Important

Disinfectants and cleaners containing bleach, phenolics, or iodines can damage the Pedi-mate. Do not disinfect or clean the Pedi-Mate with products containing these chemicals.

1.3 Bloodborne Disease Notice

To reduce the risk of exposure to bloodborne diseases such as HIV-1 and hepatitis when using the Pedi-Mate, follow the disinfecting and cleaning instructions in this manual.

1.4 Safety and Instruction Labels

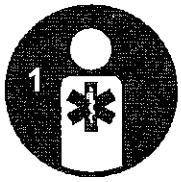
Safety and instruction labels place important information from the Users' Manual on the Pedi-Mate.

Read and follow label instructions. Illustrations showing how to attach the Pedi-Mate to a cot are printed directly on the Pedi-Mate base. For complete instructions, see *Using the Pedi-Mate*, pages 8-11.

1.5 Symbol Glossary

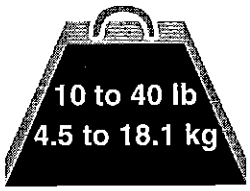
The symbols defined below appear in this users' manual. Ferno uses symbols recognized by the International Standards Organization (ISO), the American National Standards Institute (ANSI), and the emergency medical services industry.

Indicates a general warning of potential injury. Specific warnings are indicated by the words or additional symbols used with the triangle symbol.



Use of the Pedi-Mate requires a minimum of one trained operator.

Read the Users' Manual



The Pedi-Mate load limit is minimum 10 lb (4.5 kg) and maximum 40 lb (18.1 kg).

2 - OPERATOR SKILLS AND TRAINING

2.1 Skills

Operators using the Pedi-Mate need:

- ❑ a working knowledge of emergency patient-handling procedures.
- ❑ the ability to assist the patient.
- ❑ a complete understanding of the procedures described in this manual.

⚠ WARNING

Untrained operators can cause injury or be injured. Permit only trained personnel to apply the Pedi-Mate.

2.2 Training

Trainees need to:

- ❑ follow a training program designed by their training officer.
- ❑ read this manual. For additional free users' manuals, contact your Ferno distributor or Ferno Customer Relations (page 13).
- ❑ practice with the Pedi-Mate before using it in regular service.
- ❑ be tested on their understanding of the Pedi-Mate.
- ❑ record their training information. A sample training record sheet is provided on page 14.

4 - USING THE PEDI-MATE®

4.1 Before Placing the Pedi-Mate in Service

- ☐ Personnel who will work with the Pedi-Mate need to read this manual and practice using the Pedi-Mate.
- ☐ Confirm that the Pedi-Mate operates properly. Follow instructions in *Inspecting the Pedi-Mate*, page 12.

4.2 General Guidelines for Use

- Medical advice is beyond the parameters of this manual.
- It is the Pedi-Mate users' responsibility to ensure safe practices for the patient and themselves.
- It is the responsibility of qualified Emergency Medical Service personnel to assess the patient's condition and determine the proper equipment and procedures to use.
- Follow standard emergency patient-handling procedures when using the Pedi-Mate.
- Stay with the patient at all times.
- Always use the the patient harness.
- Use the Pedi-Mate only when all elements are in good working order.
- Use the Pedi-Mate only with the approved cot models listed on page 5.
- **Never** use the Pedi-Mate in a captain's chair or front seat of an ambulance.
- **Never** use the Pedi-Mate as an immobilization device or as part of an immobilization system.
- If the Pedi-Mate is in use at the time of a vehicular accident, remove the Pedi-Mate from service and replace it.

⚠ WARNING

Improper application can cause injury. Apply the Pedi-Mate only as described in this manual.

⚠ WARNING

An unattended patient can be injured. Stay with the patient at all times.

⚠ WARNING

Secure and snug all straps. Unsecured or loose straps may allow movement and result in injury or death of the patient.

4.3 Preparing the Cot and the Pedi-Mate

1. Remove any restraints attached to the cot.
2. Raise the cot backrest and lock it in place at an angle between 15 and 45 degrees. This will keep the patient's shoulders higher than the pelvis and maintain the proper center of gravity.
3. Unroll the Pedi-Mate and spread it flat on the cot mattress with all straps extended.
4. Center the blanket left to right on the mattress
5. Position the blanket with the black backrest strap at the point where you expect the patient's shoulders to rest (Figure 1).
6. Run the ends of the backrest strap around the cot backrest until they meet in back, then fasten the buckle (Figure 2). Leave some slack in the strap for final adjustment.

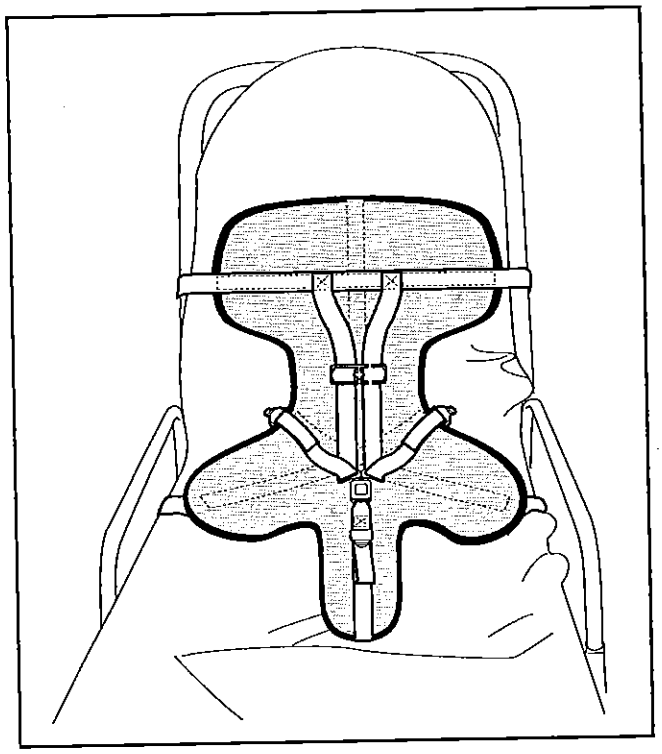


Figure 1 - Pedi-Mate Positioned on a Cot

4.4 Securing the Pedi-Mate On the Cot

1. Place the patient on the Pedi-Mate. If the black backrest strap is not at the patient's shoulder level, adjust the blanket position.
2. With the blanket properly positioned, tighten the backrest strap by pulling very firmly on the free end of the strap until the mattress is compressed.
3. Fasten a main-frame strap by threading the free end downward between the cot main frame and mattress next to the head-end sidearm casting.
4. Wrap the strap up around the cot main frame and fasten the buckle (Figure 3). Leave a little slack in the strap for final adjustment.
5. Repeat with other main-frame strap.
6. Tighten each main-frame strap by holding onto the buckle with one hand and pulling firmly on the free end of the strap.

Note: ***To loosen a main-frame strap, unfasten it, then grasp the buckle tongue and pull outward. Refasten the buckle.***

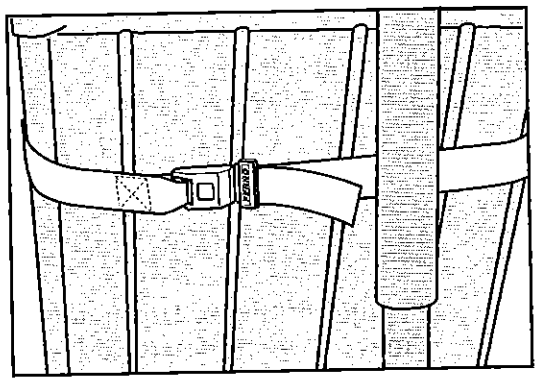


Figure 2 - Attaching the Pedi-Mate Backrest Strap

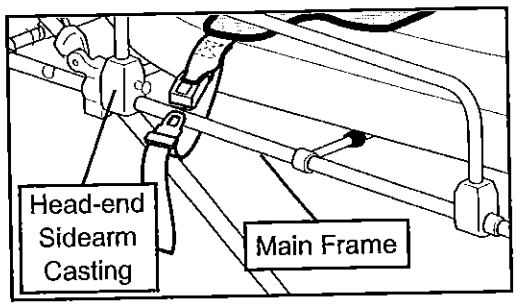


Figure 3 - Attaching a Strap to the Cot Main Frame

4.5 Securing the Patient in the Pedi-Mate Harness

1. Pull the crotch strap buckle up between the patient's legs and lay the strap on the patient's abdomen.
2. Lift a shoulder strap over one shoulder of the patient. Place the patient's arm through the strap, then lock the buckle half into the central buckle (Figure 4).
3. Repeat with the other shoulder strap.
4. Thread the shoulder strap on the patient's left side through the chest clip (Figure 5) and slide the chest clip to armpit level.
5. To snug the shoulder/torso straps, refer to Figure 6 and use the following procedure:
   - Snug the shoulder strap (C) against the shoulder and chest by pulling section A of the strap with one hand while steadying the central buckle with the other hand.
   - Repeat with the other shoulder strap.
   - Snug the torso strap (A) by pulling on section B with one hand while steadying the central buckle with the other hand.
   - Repeat with the other torso strap.
6. Snug the crotch strap by pulling on the free end.

⚠ WARNING

Secure and snug all straps. Unsecured or loose straps may allow movement and result in injury or death of the patient.

LOOSENING THE HARNESS STRAPS

To loosen the straps, refer to Figures 7 and 8 and use the following procedure:

1. Grasp the adjustment tab (Figure 7) with one hand and pull the torso strap (A) back through the tab with your other hand.
2. Steady the central buckle with one hand and loosen the shoulder strap (C) by pulling it upward with the other hand.
3. Repeat with the other shoulder/torso strap.

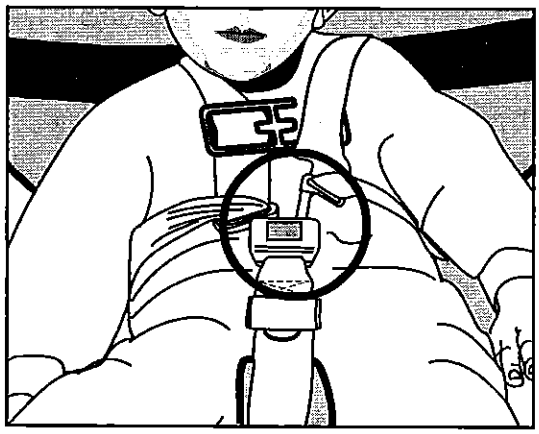


Figure 4 - Fastening a Shoulder Strap

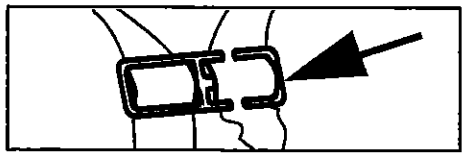


Figure 5 - Shoulder Straps in Chest Clip

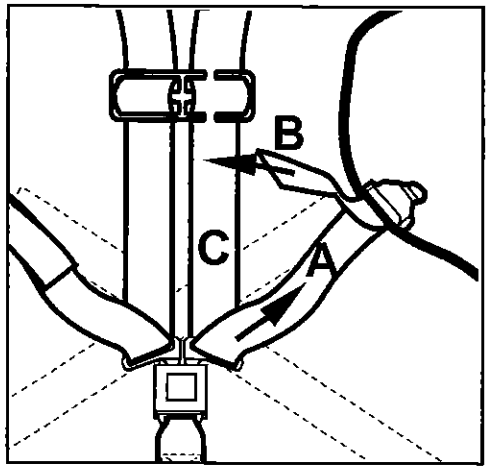


Figure 6 - Snugging the Straps

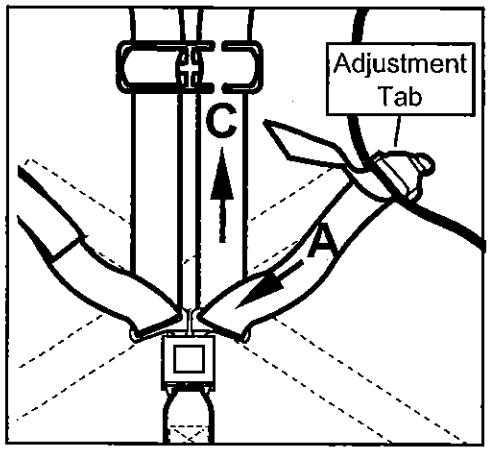


Figure 7 - Loosening the Straps

4. Loosen the crotch strap by grasping the adjustment tab with one hand and pulling downward on the portion of the strap that rests against the body (Figure 8).

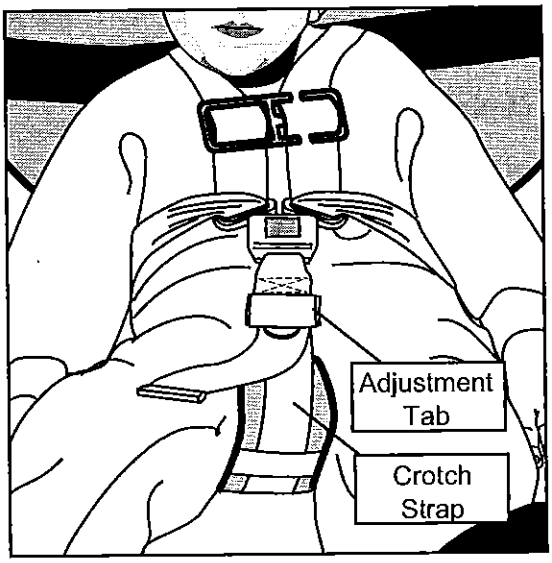


Figure 8 - Loosening the Crotch Strap

4.6 Releasing the Patient from The Pedi-Mate Harness

1. Loosen the crotch strap.
2. Slide the chest clip down toward the central buckle and unthread the shoulder strap on the patient's left side from the clip.
3. Press the red release button in the central buckle and pull the buckle slightly downward to release the shoulder straps from the buckle.
4. Loosen the shoulder straps and slide them away from the patient's body.
5. Lift the patient from the Pedi-Mate according to local protocols.

4.7 Storing Pedi-Mate

1. Detach the Pedi-Mate from the cot and spread it flat on the cot mattress.
2. Attach the shoulder straps to the central buckle and adjust all straps to lay smoothly against the blanket.
3. Fold the backrest straps across the blanket.
4. Fold the crotch panel up toward the center of the blanket.
5. Fold the cot main-frame straps and the lower blanket panels across the center of the Pedi-Mate.
6. Beginning at the crotch panel, roll the Pedi-Mate upward. Secure the roll with the hook-and-loop straps.

5 - MAINTENANCE

5.1 Maintenance Schedule

The Pedi-Mate requires regular maintenance. Set up and follow a maintenance schedule (see maintenance record sheet on page 15). The table at right represents minimum intervals for maintenance.

When using maintenance products, follow the manufacturers' directions and read the manufacturers' material safety data sheets.

Minimum Intervals For Maintenance	Each Use	As Needed	Each Month
Disinfecting (this page)	•		
Cleaning (this page)		•	
Inspecting (this page)		•	•

5.2 Disinfecting the Pedi-Mate

Wipe or spray all surfaces of the Pedi-Mate and all straps. Follow the disinfectant manufacturer's directions for application and contact time.

5.3 Cleaning the Pedi-Mate

Hand wash the Pedi-Mate blanket and all straps with warm, soapy water and a clean cloth or soft brush. Rinse with clear water. Dry the blanket with a towel and allow the straps to air dry.

Do not immerse the buckles in water.

5.4 Inspecting the Pedi-Mate

Have your service's equipment maintenance personnel inspect the Pedi-Mate. Follow the inspection checklist.

If the inspection shows damage or excessive wear, remove the Pedi-Mate from service. Ferno recommends that in addition to scheduled maintenance, operators perform a visual inspection each time the Pedi-Mate is used. If damage is noted, remove the Pedi-Mate from service immediately and replace it.

INSPECTION CHECKLIST

- ❑ Are all components present?
- ❑ Is the Pedi-Mate free of excessive wear?
- ❑ Is all stitching secure?
- ❑ Do the central buckle and adjustment tabs operate properly and smoothly?
- ❑ Are there cuts or tears in the blanket or straps?

⚠ WARNING

Improper maintenance can cause injury. Maintain the Pedi-Mate only as described in this manual.

⚠ WARNING

Modifying the Pedi-Mate can cause injury and damage. Use the Pedi-Mate only as designed by Ferno.

Important

Disinfectants and cleaners containing bleach, phenolics, or iodines can damage the Pedi-mate. Do not disinfect or clean the Pedi-Mate with products containing these chemicals.

Important

If the Pedi-Mate is in use at the time of a vehicular accident remove the Pedi-Mate from service and replace it.

6 - LIMITED WARRANTY SUMMARY

Ferno products are warranted to be free from defects in material and workmanship for a period of one year, except:

- External finishes (gelcoat, paint, powdercoat, decals, etc.) are warranted for 90 days.
- Soft goods (webbing, vinyl, fabric, foam, etc.) are warranted for 90 days.
- Fiberglass AquaCiser tanks are warranted against leakage for 5 years.
- Stainless whirlpool tanks are warranted against tank shell leakage and corrosion for 5 years.
- Mortuary products (except hydraulic parts and soft goods) are warranted for 2 years.
- Ambulance cots and ambulance transporters (except external finish and soft goods) are warranted for 2 years.
- EZ Glide™ Chairs are warranted for 2 years.
- EMS bags (replaceable bottom excluded) and backboards are warranted for lifetime replacement. (Damage caused by accident, abuse, misuse or improper care will be repaired at a reasonable charge for which you will be informed prior to the repair work being done.)
- Integrated Charging System (ICS) is warranted for 2 years.

Ferno repairs are warranted for 90 days from the date of repair.

This limited warranty applies only when the product is used as described in the instructions provided. The warranty period begins when the product is shipped from Ferno or when you receive it if you have proof of delivery. Shipping charges are not covered by this limited warranty. Ferno is not liable for shipping damages or damages sustained through using the product.

Non-Ferno products sold by Ferno retain the product manufacturer's original warranties. Ferno offers no warranties of any kind additional to those of the product manufacturer, nor does Ferno assume any liability for products manufactured by others.

Limited Warranty Obligation

If a product is proven defective, Ferno will repair or replace it, or, at our option, refund the item's purchase price. In no event is Ferno liable for more than the selling price of the product. The purchaser accepts these terms in lieu of all damages.

This is a summary of the limited warranty. The actual terms and conditions of the limited warranty, and the limitations of liability and disclaimers, are available upon request by calling 1.800.733.3766 or 1.937.382.1451.

7 - FERNO CUSTOMER RELATIONS

Customer service and product support are important aspects of each Ferno product.

Please have the date of manufacture of your Pedi-Mate available when calling Ferno Customer Relations, and include it in all written communications.

The coded date of manufacture is stamped on the Pedi-Mate label sewn to the back side of the Pedi-Mate blanket.

For assistance, please contact Ferno Customer Relations:

Telephone (Toll-free)..... 1.877.733.0911
Telephone 1.937.382.1451
Fax (Toll-free) 1.888.388.1349
Fax 1.937.382.6569
Internet ..... www.ferno.com

TRAINING RECORD

Date	Name	Training Method

MAINTENANCE RECORD

Date	Maintenance Performed	By

RESCU-Air

Air Filled Child Transport Seat

EP-96

User Manual (EP-43)

Manufactured Exclusively By

EMERGENCY Products + Research

Creating Industry Standards.

890 West Main Street
Kent, OH 44240-2218

Telephone 330-673-5003
Fax 1-330-673-4940

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WARNING

Do not use this car seat until you have read and understood all the instructions and warnings provided. Improper use of the product places the child at a greater risk and could result in unnecessary injury or death.

The Rescu-Air™ (EP-96) is certified for use in motor vehicles and aircraft.

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For questions or comments regarding the Rescu-Air™, please visit www.epandr.com or call 1-800-322-5725.

10. Replacement Parts

REPLACEMENT PARTS

EP-52 . . . . . Carry Bag

EP-65 . . . . . Main Harness

EP-72 . . . . . Air Pump

EP-73 . . . . . Filler Hose

EP-74 . . . . . AC/DC Converter

11. Additional Warnings

WARNING!

To be used by trained EMS Personal only

Do Not Use in Front Seat

Not to be used in any Pass. Car or Light Truck

Never Leave Children Unattended

Not a Spinal Stabilization Device

Not a Flotation Device

8. Warranty

LIMITED WARRANTY

Emergency Products and Research warrants this product to be free from defects due to workmanship or materials for a period of 90 days from date of purchase. The company will at its discretion repair or replace any defective product or part within the warranty period.

The company is not responsible for accident or injury due to customer misuse, abuse, improper installation or storage.

Warranty is not transferable.

9. Testing

TESTING CRITERIA

The Rescu-Air™ has complied with and completed the following tests:

FMVSS-213
CAMVSS-213

Aircraft Inversion Test
FMVSS-213, S8.2. S8.2.5, S8.2.6

1. Important Safety Information

WARNING

Failure to follow each of these instructions can result in the child striking the vehicle's interior during a sudden stop or crash.

Secure the child restraint with a vehicle belt as specified in the instructions.

In the event that your Rescu-Air seat is involved in an accident, replace it.

For maximum safety protection, the car seat should be installed in the rear seat of the vehicle. If the rear seat of the vehicle has three passenger seating positions, the center position is recommended.

For a snug but comfortable fit, take up the belt slack by pulling each shoulder belt through the belt adjuster metal clip. Then test that the belts are locked by pulling the belts away from the child. The belts should not move more than one inch.

Place the Rescu-Air in a front-facing position. This seat should be used in forward-facing vehicle seats with a lap belt {or lap and shoulder belt (an additional i-shaped clip will be required) see page 6}. The lap section must be of the type that will tightly anchor the Child Transport Seat in place at all times.

The Rescu-Air is not recommended for:

1. Vehicle front seats with airbags.
2. Vehicle seats with backs that can fold forward in a crash or sudden stop. Some seat backs automatically lock in an emergency. Check the owner's manual or with the dealer if you are not sure.
3. Seating positions with belts that automatically surround the passenger as the door is closed.
4. Seating positions with emergency locking lap belts or with other lap belts that do not keep the Child Transport Seat tightly anchored at all times.

2. General information concerning the Rescu-Air Air Filled Child Transport Seat

The Rescu-Air is designed to restrain children in a cushion of air when they travel and to provide them with a greater level of protection than without a car seat or even with a traditional car seat. However, an automobile accident exposes children to injury even when they are properly restrained. No one can predict whether a car seat will prevent injury or death in a particular accident but proper use has been proven to reduce the risk.

The Rescu-Air is for use as a front facing seat for children between 20 and 40 pounds who are up to 40 inches in height.

Even though the Rescu-Air is soft, always securely attach the vehicle belt to the Child Transport Seat even when it is not occupied. In a crash or sudden stop, the unrestrained car seat alone may cause an unpredicted injury.

This instruction guide applies to the use of the Rescu-Air in motor vehicles (and model EP-96 in aircraft).

When not in use the Rescu-Air should be stored in its travel bag under the vehicle seat or in the trunk of the vehicle. If remaining in the vehicle, the seat should be securely fastened by the vehicle seat belt to the rear seat.

7. Care Instructions

The nylon carrying bag is machine washable. Wash in cold water, gentle cycle, and tumble dry on low heat.

The coated nylon fabric material of the Rescu-Air Air Filled Child Transport Seat has been specially treated to be free of stains. To clean the Child Transport Seat, wipe clean using a wet towel with a mild detergent. Do not clean with bleach.

Do not store the Child Transport Seat with any sharp objects.

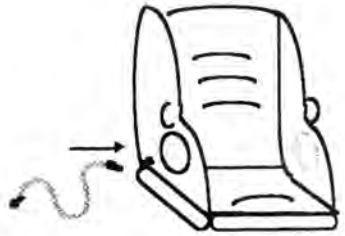
Keep the Child Transport Seat away from stoves, heaters, campfires, and other hazards.

Never use any objects to punch the Child Transport Seat.

If you have any questions regarding proper use of your Rescu-Air call us toll free in the continental United States at 1-800-322-5725 or e-mail us at info@epandr.com

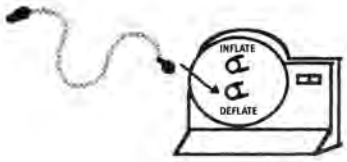
6. Deflating and Storing the Child Transport Seat

Connect one end of the inflation hose to the inflation valve of the Rescu-Air. You will hear a "click" from the inflation valve and a "whoosh" of air being released.



Step 1

Connect the other end of the inflation hose to the socket marked "deflate" on the pump.



Step 2

Make certain the pump is switched off then plug the pump into the 12 Volt DC vehicle cigarette lighter socket.

Step 3

Switch the pump on and deflate the Child Transport Seat for approximately 60 seconds (the seat will collapse on itself).

Step 4

Switch the pump to off, unplug hose from seat and cap seat valve.

To Store:

Fold sides inward, then fold bottom of seat upward against inside back of seat, overlap with top portion of seat. Slide folded seat carefully into padded carry case. Wrap pump wire around pump and place in carry case with seat. Roll up inflation hose, do not fold, and place in bag with pump and seat.

Zip carrying case and store in secure place.

3. Installing and Inflating the Child Transport Seat

Open the carrying bag and take out all of the items inside of the bag. You will find one i-shaped metal clip, one Child Transport Seat, one 12 volt dc pump, and one inflation hose.

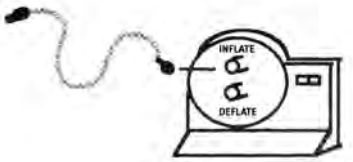
If any parts are missing, please contact Emergency Products and Research. Do not use any other parts to replace them.

Inflating Via Pump

(Model EP-96)

Step 1

Connect one end of the inflation hose to the socket marked "inflate" on the pump. Connect the other end of the hose to the inflation valve of the Rescu-Air. You will hear a "click" from the inflation valve.



Step 2

Make certain the pump is switched off then plug the pump into the 12 Volt DC vehicle cigarette lighter socket.

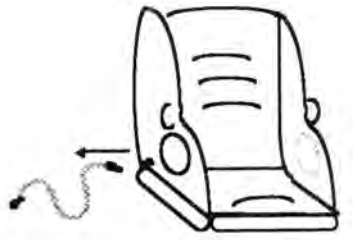
Step 3

Open the Child Transport Seat. Do not put any object on the car seat as this will cause improper pressure during inflation.

Step 4

Switch on the pump and inflate the Child Transport Seat for approximately 60 seconds (the sides will be firm and the bottom of seat will be slightly softer, the air will adjust to fill entire seat evenly).

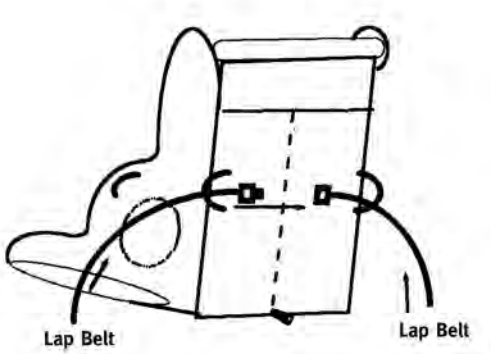
Switch the pump to off, unplug hose from seat and cap seat valve.



4. Securing the Child Transport Seat to The Vehicle

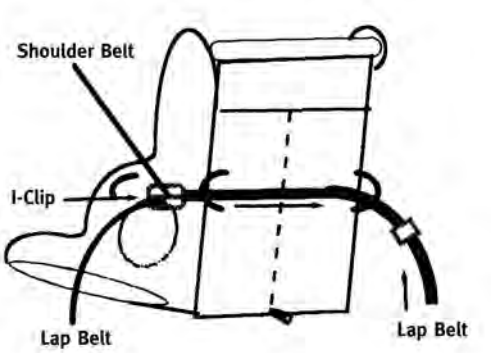
A. Lap Belt

Run the vehicle belt through both of the frame handles on the back of the seat, buckle the belt and tighten it until the back of the Child Transport Seat contacts the back of the vehicle seat and the base of the Child Transport Seat is totally flat on the seat surface of the vehicle seat.



B. Lap-Shoulder Belt

Use the I-Clip to hold the vehicle belts together securely before running them through both of the frame handles, then buckle the belt and tighten it as indicated above.



5. Securing the child

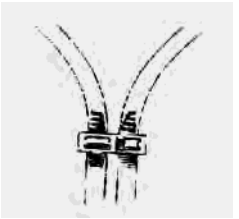
A. Release the buckle by pressing the "red" buckle button.

B. Place the child in the Child Transport Seat.

C. To secure the child, position the torso straps over the child's shoulders and secure them to the buckle. Check that the belts are not crossed and that the red release button is facing away from the child.

D. For a snug but comfortable fit, take up the belt slack by pulling each shoulder belt through its belt adjuster. Test that the belts are locked by pulling the belts away from the child. The belts should not move more than two fingers.

E. Position the sliding chest clip at the child's chest and, holding the two shoulder belts together, insert the right side belt under the retainer clip.



F. Buckle the lap belt which extends from the two red handles at the -front of the seat and tighten it until the sides of the Child Transport Seat bend inward slightly.

G. To remove the child, release the front belt, push the red release button on the torso straps, and remove the right side strap from the chest clip.

CRASH PROTECTION FOR CHILDREN IN AMBULANCES
Recommendations and Procedures*

Marilyn J. Bull, M.D., Kathleen Weber, Judith Talty, Miriam Manary

A joint project of the Indiana University School of Medicine and
the University of Michigan Medical School and Transportation Research Institute

Safe transportation of children in ambulances presents special challenges for emergency medical service providers and child passenger safety advocates. Effective restraint is dependent not only on the child restraint equipment used but also on the platform to which it is attached. Although research concerning the ambulance crash environment is limited, fundamental principles of occupant restraint can still be used to develop useful and effective procedures in the field.

The federally funded Emergency Medical Services for Children (EMSC) Program acknowledges the special circumstances of ambulance transport and the gap that exists between occupant restraint practices in ambulances vs. other highway vehicles. In the near term, they have concentrated on crash prevention and the general concept of restraint of all occupants and equipment to minimize the risk of injury. They also recommend that children who are not ill or injured be transported in a vehicle other than the ambulance whenever possible.

Restraint Considerations in Ambulances

Providing effective restraint for children in ambulances is a complex problem with many unique and unresolved issues. The occupant requiring transport may be acutely ill or injured, the vehicle has special characteristics for its function, and the crash environment and exposure are different from that of a family car. The ambulance environment is specifically designed for emergency treatment of passengers. Although there are variations in design, the patient compartment is typically equipped with a captain's chair that faces the rear of the ambulance, bench seats along one side of the ambulance, a cot, and storage for equipment and medical supplies. There are no forward-facing vehicle seats in the patient compartment upon which child restraints can be installed according to the manufacturers' instructions.

When determining the best restraint of a child in an ambulance, consideration must be given to the reason the child is being transported (patient vs. accompanying passenger), the medical stability of the patient, and the available locations where the child can be restrained. If not ill or injured, the child should be transported in another vehicle if at all possible, as recommended by EMSC. A police vehicle, however, is not usually a good alternative, because of the presence of prisoner screens, plastic seats, and special equipment that may compromise child restraint performance.

When transporting a child with an acute medical problem that requires constant monitoring, a current practice is to restrain the child directly to the cot with chest and hip

* The complete research paper is published in Association for the Advancement of Automotive Medicine, 45th Annual Proceedings, pp. 353-367. Barrington, IL, AAAM, 2001.

belts, even though this provides virtually no crash restraint, especially in the forward direction. Whenever possible, a restraint system designed specifically for a child should be used, but the difficult problem is determining the most appropriate restraint location and method of securement in the ambulance.

Rear-facing captain's chairs, or technician seats, can provide a good platform for some types of child restraints, and special instructions can be obtained from some child restraint manufacturers for installation of their convertible models (normal installation being either rear- or forward-facing) on an ambulance captain's chair. It is also becoming increasingly common to equip these technician seats with a built-in child restraint, suitable for use with an accompanying child or a less critical patient, but not a small infant. Use of this seat by a child, however, in either a portable or a built-in child restraint, precludes use of the captain's chair by an EMS technician.

Placement of a child restraint on a side bench seat is not recommended, because this usage applies the severity of a frontal impact to the less protected side-facing child. Such installations are specifically prohibited, with good reason, by all child restraint manufacturers.

Some types of child restraint systems can be attached to the ambulance cot. At present, most cots used in the field are anchored to the ambulance floor with a three-point "antler" positioning system along with a single friction clamp at the foot end that allows quick and easy loading of the patient. These cots do not have positive lock-in mechanisms, and they need only meet static loading requirements.

Research Methods and Results

The objectives of this study were to determine the most effective and reliable means of restraining children on an ambulance cot and to develop recommended field procedures for emergency medical service providers. A series of crash tests at 30 mph was conducted using convertible child restraints, car beds, and harness systems tested with 3-year, infant, and 6-year size dummies. Belt configuration and backrest position were varied, and it was determined that a two-belt attachment with elevated cot backrest was the method with the least performance variability for securing either a convertible child restraint or a car bed. In addition, a new cot and slide-in track fastener system significantly improved restraint performance over the older antler systems previously tested.

The test sequences in Figures 1 and 2 illustrate acceptable crash performance for a convertible child restraint and a car bed. Each restraint is held to the cot by two pairs of belts, and the elevated backrest provides additional support. Installation details are provided under Recommendations.

Unfortunately, none of the harness configurations tested proved to be satisfactory for both ease of use and effective restraint. The test sequence in Figure 3 illustrates the excessive ramping, or the movement of the dummy up the backrest in the direction of the impact, observed in most tests. A confounding factor was the thick, soft, and loose cot cushion that compressed and shifted during impact, making the job of the harness all the more difficult. Guidelines for designing better harness systems are given under Recommendations.

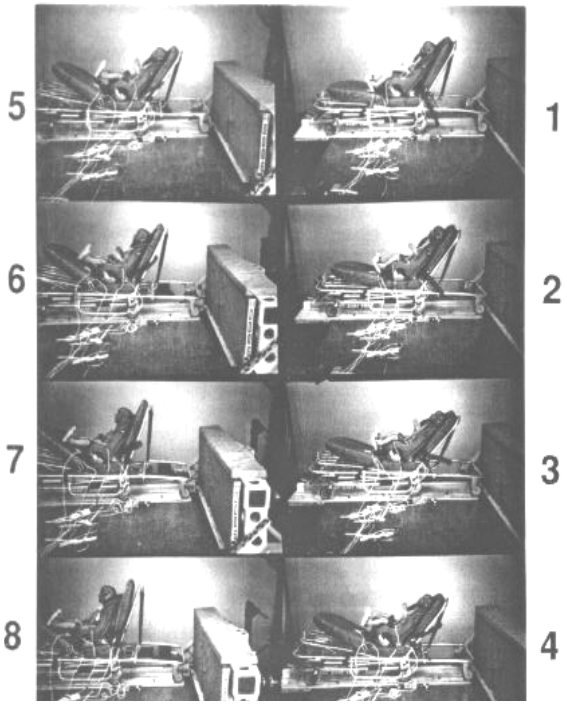


Figure 1. Crash test sequence of an 18-kg child dummy restrained in a convertible child restraint (Cvt-B3) secured using two belts to an ambulance cot with an elevated backrest and a crashworthy tie-down system.

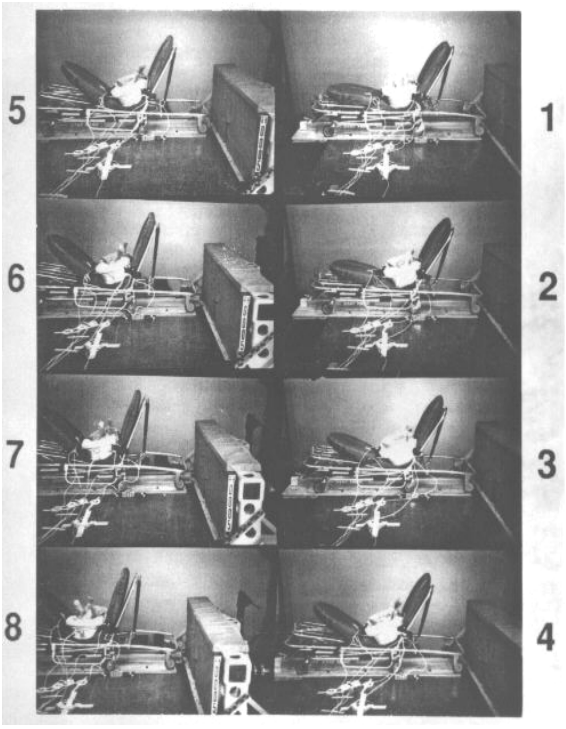


Figure 2. Crash test sequence of an 8-kg infant dummy restrained in a car bed (CB-A2) secured using two belts to an ambulance cot with an elevated backrest and a crashworthy tie-down system.

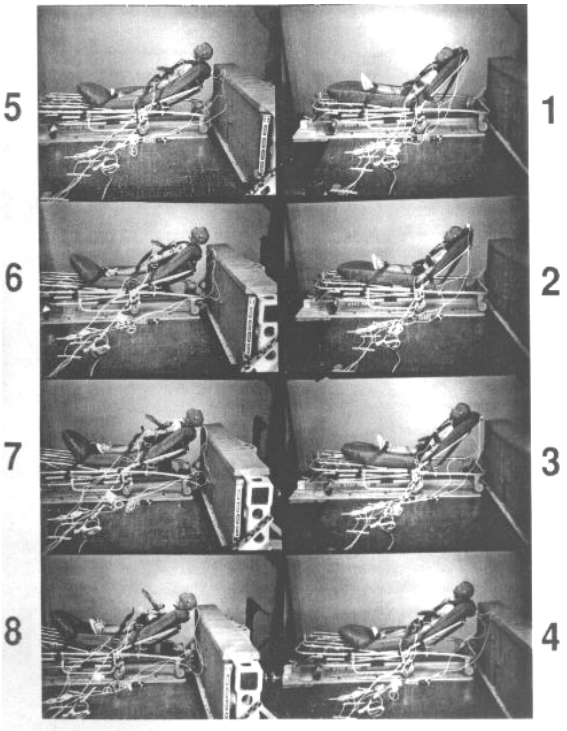


Figure 3. Crash test sequence of a 27-kg child dummy restrained in a standard cot-equipped harness system with an elevated backrest and a crashworthy tie-down system.

Recommendations

The following recommendations for restraint of children being transported in ambulances are preliminary and are aimed at providing guidance both for field use and for future research and development. They are not specifically endorsed by any child restraint manufacturers, and the usage recommended here may not be consistent with the official instructions for use of a child restraint in a passenger vehicle. Emergency service providers may wish to contact a specific manufacturer for amended instructions.

These recommendations also assume that the ambulance is equipped with a cot and fastener system that has been successfully tested under vehicle crash conditions. Less crashworthy systems may perform adequately in lower speed impacts, but their use could have catastrophic consequences in higher severity collisions.

Even with these recommendations, it is recognized that the very nature of emergency circumstances may require some compromises of best practice. For instance, it is recommended that child restraints not be used again, once they have been in a crash. If a child is found in a convertible child restraint that is still visually intact, however, it may be better to move the child in that restraint to the ambulance for transport than to transfer the child to a different restraint. Likewise, time should not be taken to adjust the height of the shoulder straps of an available restraint if they are not in the best position for rear-facing use.

Use of the EMSC guidelines and the preliminary recommendations provided here will significantly improve the safety of children during ambulance transport. As more information is available about ambulance characteristics and crashes and new products are developed, testing procedures and additional investigations may result in evolving recommendations and establishment of further best-practice procedures. Until additional information is developed, the following recommendations should be incorporated into ambulance transport practice.

CONVERTIBLE CHILD RESTRAINT SYSTEMS

For restraining children up to about 18 kg who can fit into a convertible child restraint and can tolerate a semi-upright seated position (Figure 4):

- Use only a convertible child restraint, which can be secured with belts against both rearward and forward motion, and select one that has a 5-point harness for routine use. Infant restraints, which have only a single belt path, cannot be installed using this method.
- Position the convertible child restraint on the cot facing the foot-end with the backrest fully elevated. Adjust the restraint recline mechanism so that the back surface fits snugly against the backrest of the cot. The resulting angle should be comfortable for the child but not more than 45° from vertical.
- Anchor the convertible child restraint to the cot using two pairs of belts. One should be attached to the cot backrest in a location that will not slide up or down and routed through the restraint belt path designated for “forward-facing” installation. The other should be attached rearward of the farthest side rail anchor and routed through the restraint belt path designated for “rear-facing” installation.

- Fasten the 5-point harness and snugly adjust it on the child. Ideally, the shoulder straps should be through slots at or just below the child's shoulders, since the convertible child restraint will be oriented rear-facing.
- For small infants, place rolled towels or blankets on either side of the child to maintain a centered position in the restraint.

Figure 4. Recommended method for restraining children up to about 18 kg who can tolerate a semi-upright seated position, showing belt attachment to the cot and routing through the convertible child restraint.

CAR BED SYSTEMS

For restraining infants who cannot tolerate a semi-upright seated position or who, for other reasons, must lie flat (Figure 5):

- Use only a car bed that can be secured with belts against both rearward and forward motion. Car beds with a single belt installation cannot be installed using this method.
- Position the car bed across the cot, so that the child lies perpendicular to it, and fully raise the backrest.
- Anchor the car bed to the cot with two pairs of belts attached to the cot as described above.
- Fasten the harness or other internal restraint and snugly adjust it on the infant.

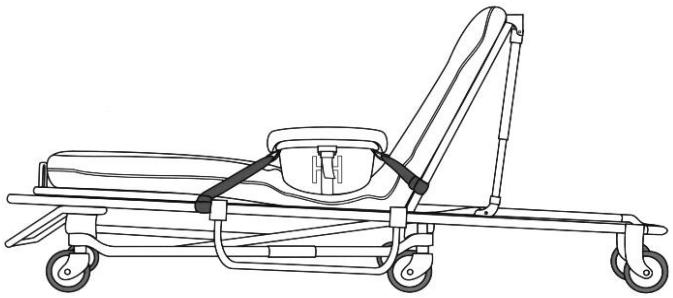


Figure 5. Recommended method for restraining infants who cannot tolerate a semi-upright seated position, showing belt attachment to the cot and routing through the car bed loops.

HARNESS SYSTEMS

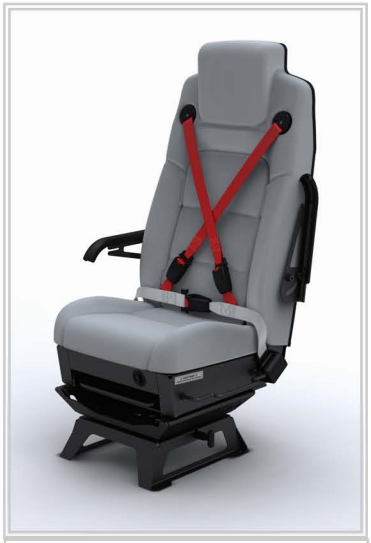
A recommendation cannot be made at this time for restraint of a child who cannot be accommodated in a convertible child restraint or car bed, either due to size or medical condition. Instead, recommendations are made for the design of an effective harness system for use on an ambulance cot. Harness features needed are

1. fixed shoulder belt attachments or slots at or just below the child's shoulders to limit ramping;
2. a belt anchored to the lower side rails of the cot that is restricted from sliding and is routed over the thighs, not around the waist;
3. a belt running parallel to the cot that connects the lap belt to a non-sliding cot member or perpendicular belt in the leg area to keep the lap belt in place and restrict ramping;
4. a soft, sliding, or breakaway connector holding the shoulder straps together on the chest; and
5. lightweight one-handed strap adjusters.

At present the usual alternative for these children is the standard belt system provided on the cot. It is hoped, however, that these recommendations will hasten the development of new harness products.

GUARDIAN™ SAFETY SEAT

It's what's inside that matters!



Guardian's "3 seats in 1" design is the only single solution for safe and effective transportation of all ages!

Adult Seat

- Application specific engineered, and built for maximum strength and safety
- ABTS construction including either a 3-point or 4-point restraint system
- Commercial grade tracks allow for smooth forward and backward adjustment
- Seat swivels 360^{0} while locking at 0 and 180^{0}
- Unique upholstery material provides a high level of comfort and durability
- Completely seamless construction allows for easy cleaning and OSHA compliance
- Crash tested in both forward and rear facing positions

Toddler & Child Seat

- Comfortably secure both toddlers and larger children from 23 to 85 pounds
- The child seat is easily deployed by simply folding down the back cushion
- A 5-point restraint system safely restrains the child during transport
- Easily adjustable straps and soft cushion headrest
- Unique seamless construction allows for easy cleaning and OSHA compliance

Infant Seat

- Safety Interlock Bar ensures seat is only deployed in the correct rear facing position
- Seat automatically locks in the 45^{0} position
- 5-point restraint system comfortably and safely restrains the infant during transport
- A single pull of the adjustment strap allows the belt system to fit infants 5 to 22lbs
- Disposable padded insert allows for easy clean up
- Designed to be quick and easy to use with minimal training

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SafeGuard TRANSPORT™

- Fits children from **22 to 100 pounds**
- Proven effectiveness through extensive crash testing
- Developed in collaboration with Riley Hospital for Children
- One operation tightens harness and adjusts height
- Seamless foam pad designed for easy cleaning

Presently, the vast majority of ambulance cots are equipped with harnesses designed for adults, resulting in an increased risk of injury to pediatric occupants in the event of a crash. Research conducted by IU Riley Hospital for Children has demonstrated the need for a more effective means of restraining children on ambulance cots. In response, **SafeGuard, with assistance from IU Riley, has developed a versatile solution to more safely transport pediatric patients of a wide range of sizes.**

Marilyn Bull, MD
Director, Automotive Safety Program
Riley Hospital for Children

Each year in the US, 6 million children are transported by ambulance. The SafeGuard Transport is **ambulance safety for kids** – the first cot-mounted restraint that safely transports children of a wide range of sizes, from 22 to 100 pounds.

Developed in collaboration with Riley Hospital for Children in Indianapolis, the product meets a currently un-served need and is the most thoroughly crash-tested ambulance restraint on the market.

The Most Advanced Protection for your Child

SafeGuard TRANSPORT™

SafeGuard has been the leader in child occupant protection for over 20 years and is the largest child seating safety products manufacturer in the world. With its own state-of-the-art crash test facility, in-house certified child passenger safety technicians, and engineers who are experts in their field, SafeGuard is working to achieve one goal- to provide the most advanced protection for your child.

- Transports children of a wide range of sizes, from **22 to 100 pounds.**
- **Developed in collaboration** with Riley Hospital for Children in Indianapolis.
- **One operation tightens harness and adjust height,** securing the child within seconds in a 5-point restraint.
- **Integrates easily** into ambulance operations, stowing efficiently in space-limited storage areas.
- **Color coded webbing** with snap hooks make attachment to cots quick and easy.
- **Moves with the cot backrest** to accommodate multiple positions from horizontal to 70 degrees, allowing easy access to the patient during transport.
- **Seamless foam pad** is impervious to body fluids and is designed to facilitate easy cleaning.
- **Extensive, rigorous crash testing** assures the product is dependable and effective for transporting children safely in ambulances.

Note: The SafeGuard Transport is not a backboard, so it is NOT intended for use with potential spinal cord injuries.

Color Coded for Easy Attachment

5-Point Harness with One-Handed Adjustment
PATENT PENDING

Lightweight and Stows Efficiently

Product Specifications

Product Weight	<20 lbs.
Folded Dimensions	29.5"h x17"w x 6.5"d
Instructional DVD included	
Replacement parts available	

Testing Technology

Design engineers at SafeGuard utilize the company's state-of-the-art testing facility to assure performance of child seating products. The Center for Advanced Product Evaluation (CAPE) conducts dynamic sled testing and full vehicle testing, making SafeGuard the only child seating manufacturer to offer this capability on-site. Extensive and rigorous testing of every SafeGuard product enables the company to deliver dependable, high quality seating products for children riding in vehicles.

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SafeGuard and LifeGuard Technologies are divisions of IMMI, a world leader in occupant protection.

The Do's and Don'ts of Transporting Children in an Ambulance

Approximately six million children are transported by emergency medical services (EMS) vehicles each year in the United States. There are risks of injury associated with transport that can be minimized. An ambulance is NOT a standard passenger vehicle. Unlike the well-developed and publicized child passenger safety standards and guidelines, specifications for the safe transport of ill and injured children in ambulances are still under development. Standard automotive safety practices and techniques cannot be applied directly to EMS vehicle environments due to biomechanical and practical differences. Caution is encouraged in the application of passenger vehicle principles to ambulances and in the utilization of new and unproven products.

The Emergency Medical Services for Children (EMSC) Program supports efforts to improve the safety of pediatric patients being transported in EMS vehicles. Through an EMSC grant, the Division of Pediatric Emergency Medicine at Johns Hopkins Children's Center is working to fill critical knowledge gaps and developing standards for pediatric EMS transport safety. Project results should be available in the year 2000.

A national consensus committee, sponsored by the EMSC Program, is reviewing current EMS child transportation safety practices. The group, which includes representatives from EMS national organizations, federal agencies, and transportation safety engineers, is developing preliminary recommendations for EMS providers until scientific research is completed.

There are certain practices that can significantly decrease the likelihood of a crash, and in the event of a crash or near collision, can significantly decrease the potential for injury. These practices are listed below. Importantly, as is mandated in several states, the NHTSA Emergency Vehicle Operating Course (EVOC), National Standard Curriculum or its equivalent is an integral part of this transport safety enhancement.

Pending research and consensus outcomes, the following guidelines for good practice should be observed when transporting children in EMS vehicles.

Do's

✓ DO drive cautiously at safe speeds observing traffic laws.

✓ DO tightly secure all monitoring devices and other equipment.

✓ DO ensure available restraint systems are used by EMTs and other occupants, including the patient.

✓ DO transport children who are not patients, properly restrained, in an alternate passenger vehicle, whenever possible.

✓ DO encourage utilization of the DOT NHTSA Emergency Vehicle Operating Course (EVOC), National Standard Curriculum.

Don'ts

✗ DO NOT drive at unsafe high speeds with rapid acceleration, decelerations, and turns.

✗ DO NOT leave monitoring devices and other equipment unsecured in moving EMS vehicles.

✗ DO NOT allow parents, caregivers, EMTs or other passengers to be unrestrained during transport.

✗ DO NOT have the child/infant held in the parent, caregiver, or EMT's arms or lap during transport.

✗ DO NOT allow emergency vehicles to be operated by persons who have not completed the DOT EVOC or equivalent.

December 1, 1999

Falmouth Fire-EMS Operating Guideline
Transporting Children Safely in Ambulances

Objective:
To establish a clear policy regarding EMS transports with child patients.

General Information:
Patients, including children, must be secured in the safest manner possible in order to ensure that proper care is rendered. This policy established the guideline for pediatric transports.

Guidelines:

A. Use of Child Safety Seat

1. When a pediatric patient is not required to be on a spine board or other immobilization device due to mechanism of injury concerns, a child safety seat is required for use on the ambulance stretcher.
2. The only approved seat to use by Falmouth Fire-EMS Department is a convertible seat.
3. This seat will be used to transport children and infants who are 5-40lbs in weight and 19-40" in height.
4. When using the seat on a stretcher, it must be mounted rear-facing.
5. The seat should be placed upon the stretcher with head reclined 45 degrees. The car seat must lie flat against the stretcher.
6. The seat must be secured to the stretcher using two pairs of belts. One belt should be attached to the stretcher backrest in a location that will not slide up or down and routed through the restraint belt path designated for "forward-facing" installation. The other should be attached rearward of the farthest side rail anchor and routed through the restraint belt path designated for "rear-facing" installation. Both belts should be tightened as much as possible so the car seat does not move more than one inch when pulled at the belt path.

*Note-Manufacturer's instructions do not specify installation on an ambulance stretcher. In a personal vehicle, only one belt path would be utilized depending upon whether the seat is used rear-facing or forward-facing. On the stretcher, the seat is always used rear-facing but BOTH belt paths are used. Additional details can be found at: http://www.preventinjury.org/uploads/researchinfo/ResearchInfo_9.pdf

7. The child shall be secured by the harness within the seat at all times. Procedures should be performed around the harness straps. Ideally, the harness straps should be in the slots at or below the child's shoulders. The harness straps should be snug on the child, allowing

for no slack. The harness retainer clip (plastic chest clip) must be positioned at the level of the child's armpits to prevent the harness straps from sliding of the child's shoulders in the event of a sudden stop or crash.

8. Blanket rolls may be used for extra stabilization around the patient but should not be placed under or behind the patient. Blankets or sheets may also be used over the patient to maintain temperature as long as the blanket or sheet is not between the patient and the harness.
9. The child seat should not be used in lieu of spinal immobilization.
10. Should a child not fit in the seat used by Falmouth, the child's own seat may be used as long as it is a convertible seat with two seat belt paths.

    *Note-The only type of car seat recommended for installation on a stretcher is a convertible seat. It is the only type of seat that has two belt paths. If the child's own seat is a convertible seat and after considering #10 and #11 below, the seat can be used. Installing any other type of seat (including infant seats, combination seats or booster seats) would be improper and unsafe for the child, as there is no appropriate method for attaching the seat to the stretcher at two anchorage points. No other types of seats will be allowed for use as this increases risk of injury/death to the child and places the department at an increase risk of liability, as recommended procedures would not have been followed.

11. If the child's own convertible seat is used, it must be undamaged and clean from any debris that may injure the child.
12. Because of the above, it is unlikely that it would be advantageous to use the child's own seat if the child was being transported in a vehicle that was in a motor vehicle crash.
13. If in doubt of proper fit and installation when using a convertible car seat, a departmental Certified Child Passenger Safety Technician should be consulted if available.

B. Use of Ferno Pedi-Mate

1. If a convertible seat is unavailable, the Ferno Pedi-Mate should be used as the next best option of restraining an infant or a child on the stretcher.
2. The weight limit of the Ferno Pedi-Mate is 10–40 lbs.
3. The Ferno Pedi-Mate must be attached securely to the stretcher utilizing the upper black strap behind the stretcher and the lower black straps around the frame of the stretcher. The straps must be tightened as much as possible. The Ferno Pedi-Mate should be adjusted so that the harness straps are at the child's shoulder level.
4. The head portion of the stretcher should be adjusted as upright as medically tolerable and comfortable for the child.
5. The 5-point harness must be used and must be snug against the child with no slack. The harness retainer clip (plastic chest clip) must be positioned at the level of the child's armpits to prevent the harness straps from sliding of the child's shoulders in the event of a sudden stop or crash.
6. Blanket rolls may be placed around the patient for extra stabilization. Blankets or sheets may also be used over the patient

to maintain temperature as long as the blanket or sheet is not between the patient and the harness.

7. If in doubt of proper fit and installation when using the Ferno Pedi-Mate, a departmental Certified Child Passenger Safety Technician should be consulted if available.

C. Spinal Immobilization

1. Children should be immobilized if the mechanism of injury warrants and spinal rule-out protocols are unable to be used.
2. In this instance, the child shall be immobilized using the Ferno Pedi-Pac device
3. The sizes of patients for this device are as follows: 28" to 54" tall, weighing 20 to 90 lb.
4. When securing the child to this board, all straps in the color-coded system will be used.
5. Should a child fall outside that range of sizes, a regular spine board will be used for immobilization. Towel and/or blanket rolls may be used to pad voids and secure the child to the board to minimize movement.
6. Pediatric c-collars will be used whenever a child is immobilized.

D. Larger Child Transportation

1. Children who exceed the weight or height limit of either the convertible car seat or the Ferno Pedi-Mate should be secured to the stretcher utilizing only the stretcher straps, using all of the straps, including the shoulder harness that has been properly fitted so that the latchplate and buckle are on the center of the sternum. This will prevent the straps from slipping off the child's shoulders, which could allow the child to be ejected off the cot. The head of the stretcher should be positioned as upright as possible.

Important Considerations:

A car seat involved in a collision may be compromised due to damage sustained in the collision as well as glass and other debris that may be in the seat. For this reason, it is encouraged that members use the Falmouth Fire-EMS car seat whenever possible.

Training:

All EMS personnel are expected to complete the course Transporting Children Safely in Ambulances presented through Maine EMS. The course will be offered every 2 years at Falmouth Fire-EMS.