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# Recommendations for the Safe Transportation of Children in Ground Ambulances

July 2010

The National Highway Traffic Safety Administration  
U. S. Department of Transportation

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Maryn Consulting, Inc.

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## Glossary of Terms

Term	Definition
Bench Seat	Also known as the squad bench, this is the multi-person side facing seat(s) alongside the cot mounting area in the rear of a ground ambulance.
Call-taker	The individual responsible for answering a call to 911 for response to an emergency situation and request for an immediate response, which may include a medical emergency and the need for emergency medical services.
Captain's Chair	Also known as the EMS provider's seat, this is the passenger location which (typically an EMS professional) faces the rear exit of the emergency ground ambulance that is typically located immediately behind the driver's seat. From this location, the person is physically able to see the patients being transported
Child restraint system (CRS)	A CRS is any device (except a passenger system lap seat belt or lap/shoulder seat belt), designed for use in a motor vehicle to restrain, seat, or position a child
Cot	A temporary bed used in emergency ground ambulances for the purposes of transporting patients via ambulance to a medical facility for treatment. Also commonly referred to as a stretcher or gurney. A wheeled cot (elevating) or wheeled cot-bench (non-elevating) may be referred to as a litter.
Emergency ambulance or emergency ground ambulance or ground ambulance	An emergency ambulance, emergency ground ambulance, or ground ambulance is a vehicle designed for the transportation of sick or injured people to, from, or between places of medical treatment.
Emergency medical services (EMS)	Emergency medical services are the responses and activities dedicated to providing out-of-hospital medical care and/or transportation to definitive medical care, to patients with illnesses and injuries which the patient, or the medical practitioner, believes constitutes a medical emergency. At the community level, EMS may also be referred to as but not limited to: first aid squad, emergency squad, rescue squad, ambulance squad, ambulance service, ambulance corps or life squad.
EMS Provider Seat	Also known as the Captain's Chair (see definition above).
EVOC	The Emergency Vehicle Operators Curriculum (EVOC) is the national standard curriculum developed by NHTSA and the U. S. Office of Personnel Management for training personnel in the safe operation of emergency ground ambulances.
FARS	The Fatality Analysis Reporting System (FARS) is NHTSA's annual census of data collected on all fatal motor vehicle traffic crashes occurring in the U. S. and the injuries, persons, and

	vehicles involved in these crashes.
Five-point cot restraint system	A system for restraining a patient to the cot of a ground ambulance, consisting of three horizontal restraints across the patient’s torso(chest, waist, and knees) and two vertical shoulder restraints across each of the patient’s’ shoulders.
FMVSS 208	Federal Motor Vehicle Safety Standard (FMVSS) 208 is the standard for Occupant Crash Protection. FMVSS 208 specifies the performance requirements for active and passive restraints (seat belts) using anthropomorphic test dummies seated in the front outboard seats of passenger cars and of certain multi-purpose passenger vehicles, trucks, and buses. The purpose of FMVSS 208 is to reduce the number of fatalities and the number and severity of injuries to occupants involved in frontal crashes.
FMVSS 213	Federal Motor Vehicle Safety Standard (FMVSS) 213 is the standard for Child Restraint Systems - Passenger Cars, Multipurpose Passenger Vehicles, Trucks and Buses, and Child Restraint Systems for use in Motor Vehicles and Aircraft. FMVSS 213 specifies requirements for child restraint systems used in motor vehicles and aircraft. The purpose of FMVSS 213 is to reduce the number of children killed or injured in motor vehicle crashes and in aircraft.
HRSA	The U. S. Department of Health and Human Services’ Health Resources and Services Administration (HRSA) is the primary Federal agency for improving access to health care services for people who are uninsured, isolated or medically vulnerable.
NEMSIS	Established in 2001, the National Emergency Medical Services Information System is a project to create a national EMS database that contains standardized data elements from local and state EMS agencies from the entire U. S.
Securement	The act or process of fastening a child restraint system or other safety device or piece of equipment to ensure the safety of the child being transported in the system or device or equipment so as not to allow movement or subject the child to unsafe or inappropriate conditions while being transported.
Stretcher	Also referred to as a cot (see definition above).
Squad Bench	Also known as the bench seat (see definition above).

## **Background**

The National Highway Traffic Safety Administration (NHTSA) of the U. S. Department of Transportation initiated a project in September 2008 titled “Solutions to Safely Transport Children in Emergency Vehicles”. The major objectives of this project were to:

1. Build consensus in the development of a uniform set of recommendations to safely and appropriately transport children (injured, ill, or uninjured) from the scene of a crash or other incident in an ambulance.
2. To foster the creation of best practice recommendations after reviewing the practices currently being used to transport children in ambulances.
3. To provide consistent national recommendations that will be embraced by local, State and national emergency medical services (EMS) organizations, enabling them to reduce the frequency of emergency transport of ill, injured or uninjured children in an unsafe and inappropriate manner.

To achieve these major objectives, a Working Group was formed; the Working Group was comprised of members with experience, background, and extensive knowledge in the current practices of the emergency transportation of children in ground ambulances. The expert members of the Working Group were drawn from those organizations and entities involved in the health care of children and the emergency transportation of children and others in ground ambulances. It should be noted that throughout the remainder of this document, references to ambulances are limited to ground ambulances, unless otherwise stated. Also, based upon the deliberations of the Working Group, it was decided to use the terms child or children vs. “youth” to the extent practical throughout the remainder of this document, to represent all children, starting at birth.

The panel of experts comprising the Working Group and the organizations represented are shown in the following table.

**Working Group Members from Children’s Health, Medical, and Emergency Organizations**

Michael Aries	International Association of Firefighters
Katrina Altenhofen, MPH, PS, EMSC Program Manager	National Association of State EMS Officials
Marilyn J. Bull, MD, FAAP	American Academy of Pediatrics
James M. Callahan, MD, FAAP, FACEP	American College of Emergency Physicians (ACEP)
Andrew L. Garrett, MD, MPH	National Association of Emergency Medical Service Physicians (NAEMSP)
Ken Knipper	National Volunteer Fire Council
Tommy Loyacono, MPA, NREMT-P	National Association of Emergency Medical Technicians
John Russell, MD, FAAP	American Ambulance Association
Joseph L. Wright, MD, MPH, FAAP	National Emergency Medical Services for Children’s Resource Center (EMSC NRC)
Cynthia Wright-Johnson, RN, MSN	Emergency Nurses Association (ENA)

General support for the project was also provided by the International Association of Fire Chiefs.

Members from NHTSA, the sponsors for the project, along with partners from other Federal agencies, also participated in the activities and deliberations of the Working Group. The Working Group members from Federal agencies are shown in the following table:

**Working Group Members from Federal Agencies**

Alexander (Sandy) Sinclair	NHTSA Headquarters (HQ), Traffic Injury Control (TIC), Research and Program Development, Office of Occupant Protection
David Bryson	NHTSA HQ, TIC, Research and Program Development, Emergency Medical Services
Thelma Kuska, RN, BSN, CEN, FAEN	NHTSA Region 5
Eileen Holloran	Health Resources and Services Administration (HRSA), U. S. Department of Health and Human Services (HHS)
Dan Kavanaugh	Health Resources and Services Administration (HRSA), U. S. Department of Health and Human Services (HHS)

Operational support for the project was provided under NHTSA contract DTNH22-08-C00085 by Maryn Consulting, Inc.

A first step to achieving the project's major objectives was to complete a review of the literature of current practices for the emergency transportation of child passengers in ground ambulances. The emphasis of the literature review included research in professional journals and elsewhere that described an ideal or model uniform approach to transport children safely in ambulances, as well as articles and publications that documented unsafe or incorrect practices. The expectation was that the findings from the literature review would serve as a point of reference for consensus building efforts towards the development of the recommendations for the safe transportation of children.

Maryn Consulting, Inc. conducted the literature review, reviewing several hundred pages of information related to ambulance safety issues and the emergency transportation of children in ground ambulances. Relevant sources addressing various aspects of the transportation of children in ground ambulances (i.e. statistical information, existing guidelines, current practices and outcomes, safety research, etc.) were examined in depth and analyzed. The expert members of the Working Group were asked to review and provide comment on the literature review before it was finalized. Key findings from the literature review served as the foundation for the deliberations and activities of the Working Group. The literature review addressed the following major topics:

- Background: An overview of statistical findings and data sources specific to ambulance transportation issues and child transportation in ground ambulances and media coverage of the issue of child transportation in ground ambulances.
- Ambulance Safety Issues: An overview of ambulance safety issues in general, with references to research and publications regarding this topic.
- Child Transport in Ambulances: Existing Guidelines: An overview of the current published guidelines regarding the safe transportation of children in ground ambulances at the national and State levels, as well as those promulgated by relevant practitioner associations.
- Child Transport in Ambulances: Current Practices and Outcomes: A description of current trends in the transportation of children in ambulances and questions identified by practitioners regarding this topic.
- Child Transport in Ambulances: Safety Research: An overview of engineering and safety research findings regarding safe and unsafe methods of transporting children in ground ambulances.

The literature review, completed in May 2009, is included in its' entirety as Appendix A.

The second step to achieving the major objectives of the project was the convening of the Working Group of experts. A series of teleconferences and a meeting were held, aimed at discussing issues of critical importance related to the major goals of the project, leading to the development of the recommendations contained in this report. Maryn Consulting, Inc. convened monthly teleconferences of the Working Group members in 2009 and 2010; deliberations were recorded. In addition to holding the monthly teleconferences, the Working Group was brought together for a one day meeting in Washington, DC on July 22, 2009. The agenda for the July 22, 2009 meeting and a list of the participants is provided as Appendix B.

## A Description of the Problem

Describing and defining the problem of the unsafe and inappropriate methods of transporting children (injured, ill, or uninjured) from the scene of a crash or other incident in a ground ambulance is somewhat challenging, due to limited data involving such crashes. Also, specific Federal standards or protocols do not currently exist to provide detailed guidance to EMS and child passenger safety professionals in the U.S. on how best to safely transport children in ground ambulances from the scene of a traffic crash or medical emergency to a hospital or other facility.

In describing the problem, it should be noted that this project focused on developing recommendations for safely transporting children in ground ambulances by defining the project scope to address those situations for which the most evidenced-based information is available. As such, the issues of neonatal intensive care transportation and the unique circumstances that may present when transporting children with special health care needs in ground ambulances, while critically important, were considered outside of the purview of this effort and are not specifically addressed in the recommendations presented in this report. For the same reasons, while the inter-facility transportation of children in ground ambulances is not specifically addressed in the recommendations provided in this report, it is recognized that many of these recommendations would also apply to those patients.

Data sources regarding ambulance crashes involving child ambulance occupants in the U. S., as well as abroad, are limited. There is no single national EMS dataset in the U. S. which can be analyzed to better understand the annual number of ambulance trips, the number that involve children, the frequency of ambulance crashes, the victims or types of injuries associated with such crashes, or the possible causes of such crashes and the injuries involved. While efforts are underway to enhance the National EMS Information System (NEMSIS) to better inform EMS related policy, protocols and practices, detailed data on crashes and other incidents involving ambulances are not easily extracted from existing EMS data collection systems.<sup>1</sup> While a number of States, local communities, and private sector EMS providers capture some of this information, these data are often not readily available or easily accessible on a national level.

Estimates suggest that ground EMS responds to approximately 30 million emergency calls each year.<sup>1</sup> Approximately 6.2 million patient transport ambulance trips occur annually,<sup>2</sup> of which approximately 10% of those patients are children.<sup>3</sup> Insurance companies report that approximately 10,000 ambulance crashes result in injury or death each year.<sup>4</sup> Estimates suggest that up to 1,000 ambulance crashes involve pediatric patients each year.<sup>5</sup> Occupational safety data indicate that “the transportation-related

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<sup>1</sup> Levick, NR. Emergency Medical Services: A Transportation Safety Emergency. Paper presented at: American Society of Safety Engineers’ Professional Development Conference; June 24-27, 2007; Orlando, FL, USA. Available at: <http://www.objectivesafety.net/2007ASSE628Levick.pdf>. Accessed December 9, 2008.

<sup>2</sup> Levick, NR. 2002. New Frontiers in optimizing ambulance transport safety and crashworthiness. *The Paramedic*. 2002; 4:36-39.

<sup>3</sup> Winters, G and Brazelton, T. Safe Transport of Children. *EMS Professionals*. July-August 2003:13-21.

<sup>4</sup> American Ambulance Association (AAA). Position Paper: Safe Driving Statement, May 6, 2002. Available at: [www.the-aaa.org/about/positionpapers/afaedriving.html](http://www.the-aaa.org/about/positionpapers/afaedriving.html). Accessed December 5, 2008.

<sup>5</sup> See Footnote 3.

mortality rate for EMS personnel (per 100,000 workers) is 9.6, a rate that eclipses the national average (2.0) and exceeds that of police (6.1) and firefighters (5.7).<sup>6</sup>

Some information regarding ambulance crashes can be gleaned from analyses of data available from NHTSA's Fatality Analysis Reporting System (FARS). However, it should be noted that the FARS data do not capture crash information unless that crash results in a fatality. A research article published in 2006 examining the specific issue of ambulance crashes using FARS data from 1987 to 1997 reported that 339 ambulance crashes were recorded; resulting in 405 fatalities and 838 injuries. These fatalities and injuries include those involving ambulance drivers and passengers, as well as other vehicle drivers and passengers, in addition to pedestrians and bicyclists.<sup>7</sup>

An examination of FARS 2008 data indicates that one fatal ambulance crash reported that year involved a child (under age 18) present in the ambulance. In that fatal crash, a seven year old male was a passenger in the cargo area of the ambulance but was not injured in the crash. FARS 2007 data indicate that three fatal ambulance crashes reported that year involved children (under age 18) present in the ambulance. In one of these fatal crashes, the child was not injured; in the other two fatal crashes the children suffered minor injuries. Because FARS data do not include all ambulance crashes, it is estimated that the number of children injured in ambulance crashes that do not result in fatalities is significantly higher than numbers reflected in FARS (see above).

Additional analysis of the FARS data indicates that in 2008 there were 27 fatal ambulance crashes which involved 62 people, including ambulance drivers and passengers, as well as other vehicle drivers and passengers, in addition to pedestrians and bicyclists. The FARS 2008 data suggest that during that year 13 individuals in the rear compartments of ambulances were involved in these fatal crashes. In 2007 there were 29 fatal ambulance crashes which involved 82 people recorded in FARS. The FARS 2007 data indicate that 34 individuals in the rear compartments of ambulances were involved in fatal crashes in 2007.<sup>8</sup>

A review of local, national, and international media coverage of ambulance crashes involving injuries to children suggests such crashes are dangerous. Articles in newspapers across the world, as well as televised news coverage at the local level, suggest ambulance crashes involve children of all ages and can result in injuries ranging from minor to fatal. Injured children may be patients or passengers accompanying a parent or caregiver; they may be receiving transportation from the scene of a crash, a medical emergency, or involved in an inter-facility transport.<sup>9</sup>

Meanwhile, Federal standards or protocols for EMS and child passenger safety (CPS) professionals in the U.S. for how best to safely transport children in ground ambulances from the scene of a traffic crash

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<sup>6</sup> Kahn, CA. EMS, First Responders and Crash Injury. *Topics in Emergency Medicine*. 2006;28(1)68-74.

<sup>7</sup> See Footnote 6.

<sup>8</sup> NHTSA. Fatality Analysis Reporting System (FARS), available at [www.fars.nhtsa.dot.gov/QueryTool](http://www.fars.nhtsa.dot.gov/QueryTool). Accessed December 5, 2008 and May 24, 2010.

<sup>9</sup> NHTSA: Solutions to Safely Transport Children in Emergency Vehicles; Literature Review Findings; May 28, 2009; Completed under NHTSA Contract: DTNH22-08-C00085 with Maryn Consulting, Inc. Sources for the articles obtained from LexisNexis search conducted in October 2008 include the Associated Press (1999, 2003, and 2008); Financial Times (2008), Press Association (1992 and 1995) and the South Africa Press Association (2003).

or medical emergency to a hospital or other facility do not currently exist. There are unanswered questions regarding the placement and restraint of injured, ill, or uninjured children among EMS and child passenger safety professionals. The absence of consistent national standards and protocols regarding the transportation of children in ground ambulances complicates the work of EMS professionals and may result in the improper and unsafe restraint of highly vulnerable child passengers. As a result, EMS agencies, advocates and academicians have turned to NHTSA for leadership, which led to this effort.

### **Previous Guidance Regarding the Safe Transportation of Children in Emergency Ground Ambulances**

The issue of variation in emergency child transport guidelines was first identified in a 1998 study which reported the results of a survey examining State requirements regarding the use of child restraint systems for children in ground ambulances.<sup>10</sup> The study revealed that 35 States did not require patients of any age to be restrained in ground ambulances. Of those States requiring the use of child restraint systems, requirements varied between requiring the child to be restrained on a cot, in a child restraint system, or both.

Following the publication of the 1998 study, NHTSA and the U. S. Department of Health and Human Services' Health Resources and Services Administration (HRSA) Emergency Medical Services for Children program (EMS-C) convened a national consensus committee to review EMS child transportation safety practices. This group of representatives from EMS national organizations, Federal agencies, and transportation safety engineers developed a document titled *The Dos and Don'ts of Transporting Children in an Ambulance* (December 1999). *The Dos and Don'ts* document provides general guidance for EMS practitioners in the field regarding how to most safely transport children in a ground ambulance. With respect to the safe transportation of children, *The Dos and Don'ts* document included the following recommendations:

- *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 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.*

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<sup>10</sup> Seidel JS, Greenlaw J. Use of restraints in ambulances: a state survey. *Pediatric Emergency Care*. 1998;14(3):221-3.

- *Do not allow emergency vehicles to be operated by persons who have not completed the DOT NHTSA Emergency Vehicle Operating Course (EVOC), National Standard Curriculum, or its equivalent.*

Since the publication of the *Dos and Don'ts* document, States, localities, and private EMS providers across the country have developed their own guidelines, some of which are more detailed than the *Dos and Don'ts* document. There remains, however, limited uniformity; EMS practitioners continue to struggle with unanswered questions. For example, a State EMS requirement to restrain all child passengers may result in the placement of a child in a child restraint system strapped to a side-facing bench in the rear compartment of an ambulance, rather than in the Captain's Chair of the ambulance. The use of a child restraint system in such a fashion is prohibited by all child restraint system manufacturers. In addition, safety researchers conclude it "is not recommended, because this usage applies the severity of a frontal impact to the less protected side-facing child."<sup>11</sup> In this example, more specific guidance regarding the safest placement of the child is required.

### **A "Non-technical" Definition of a "Child"**

Defining a "child," in order to address the safe transportation of children in emergency ground ambulances and to provide an accurate framework for developing recommendations is also a challenge. In the course of reviewing existing data, professional articles, and official protocols, as well as media coverage, it was learned that the definition of a "child" is not always consistent or consistently addressed. In many cases, a focus on very young children can be inferred from the context of the article or protocol, but a uniform definition of child has not been developed for the purposes of emergency ground ambulance transport.

At its July 2009 meeting in Washington DC, the expert members of the Working Group discussed options for defining a child for the purposes of this project by considering the following questions:

- Should age and/or stature be considered in developing our recommendations?
- Should we use previously established age categories?

The Working Group decided to use the terms child or children to represent all children, starting at birth. Next, the Working Group considered several possible options for defining a child, including: by age; by child restraint system requirements; or by height/weight. The Working Group considered the pros and cons of each option, what might be most useful to EMS professionals in the field, and what definition would be needed to ensure that all children would be safely transported. Among the options considered was NHTSA's four step protocol<sup>12</sup> for the appropriate child restraint system to be used by parents and caregivers, based upon the child's age and/or stature. The prevailing view of the expert panel members of the Working Group was that the realities of delivering EMS in the field necessitates having an

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<sup>11</sup> Bull, MJ, Weber, KB, Talty, J, Manary, MA. Crash Protection for Children in Ambulances. In: *45<sup>th</sup> Annual Proceedings of the Association of the Advancement of Automotive Medicine (AAAM)*. Des Plaines, IL: AAA; 2001:353-367.

<sup>12</sup> For details on NHTSA's 4 Steps for Kids guidance for parents and caregivers on selecting and installing the proper child restraint for children, visit [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov) and click on Child Passenger Safety in the listing on the left hand side of the home page under "Quick Clicks."

algorithm for safely transporting all occupants of a ground ambulance, regardless of age and by injury severity.

The Working Group members continued its' deliberations by considering the following question:

- How is a "child" or a "pediatric patient" in the EMS setting defined with regards to operations? Examples include: choosing the appropriate type of therapy or determining if a specialized child restraint system must be used to transport a child safely by EMS.

There is a range of options here, and little consensus. The various definitions of a child or pediatric patient are inconsistent. The term "child" may be used to denote all non-adult patients, OR it may be used to represent all non-adult, non-adolescent patients, OR it may be used to represent all non-adult, non-adolescent, non-neonatal, non-infants, etc. etc.

- Even the "non-adult" descriptor lacks consensus and is variable depending on the setting; it could be those under 17, 18, or 21 years old.
- Weight or length are commonly used to "proxy" for age in the field by EMS professionals to determine (e.g., using a measurement tape) if a patient is pediatric vs. adult.
- EMS and medical personnel are not always accurate at estimating age, height, and/or weight.
- Parents and caregivers are also not always accurate at estimating age, height, and/or weight.

To provide appropriate care, some EMS professionals prefer to use a very simple standard in the field: ***if you think your patient is a child/pediatric patient, then treat and restrain them accordingly***. This approach eliminates one additional factor or issue of concern for EMS personnel and allows them to focus on the real perils of the child patient in EMS, including safe transportation, safe use of medications and provision of therapy. While this is a "non-technical" definition, the consensus of the Working Group was to adopt this definition. This definition is practical and could be easily adopted and implemented by EMS professionals and the Working Group recommends using it in the implementation of the recommendations contained in this report. EMS professionals, their agencies and others involved in the transportation of children in ambulances are urged to consider the use of a method or technique to more accurately define the weight and height of a child, if available, in order to determine the safest method of transportation. In this regard, EMS professionals, their agencies and others may consider using a length/weight-based measurement tool or other appropriate measurement device for pediatric equipment sizing to estimate height and weight.

### **Operational Safety Issues Related to the Safe Transportation of Children in Emergency Ground Ambulances**

As stated in the Background of this report, the major goal of the Working Group was to develop a uniform set of recommendations to safely and appropriately transport children (injured, ill, or uninjured) from the scene of a crash or other emergency incident in a ground ambulance. As such, the Working Group was committed to developing recommendations that cover every aspect of an EMS ground ambulance response and the full coordination of response elements from the call-taker to the receiving medical facility.

With the foregoing in mind, the first principle to be followed to ensure the safe transportation of children in emergency ground ambulances is to make everything as safe as possible. It is important to note that safety for transporting children in an ambulance starts with general operational policy and procedures that enhance ambulance safety for all occupants, regardless of age. These include seatbelt and restraint use for ALL ambulance occupants all of the time, securement of movable equipment, driver screening and selection (including background checks as provided for by the State's EMS personnel policy), training that includes hands-on emergency ground ambulance operation instruction, monitoring of driving practices through use of technology and other means, use of principles of emergency medical dispatching to determine resource and response modalities, and methods to reduce the unnecessary use of emergency lights and sirens. While the recommendations which follow may not mention these operational policy and procedures specifically, it is anticipated that EMS professionals and their organizations will implement operational policies and procedures which address these factors to the maximum extent possible.

To support the recommendations which follow, and within the limitations as stated, guidelines for the gathering of statistics and design engineering standards for the chassis, patient module, treatment equipment, and the testing and maintenance of those ideals will be required. It is important to note, however, that the project effort leading to the development of the recommendations contained in this report did not include a determination on these issues or others which may be related, e.g., evaluating the efficacy of one child restraint system compared to another; conducting field tests of transport solutions or equipment; evaluating the crashworthiness of EMS ground ambulances; and assessing ambulance design.

### The Goal of the [Draft] Recommendations

The ultimate goal of the recommendations contained in this report is to:

***Prevent forward motion/ejection, secure the torso and protect the head, neck, and spine of all children transported in emergency ground ambulances.***

By ensuring that this goal is met in all scenarios involving the transportation of children in emergency ground ambulances from the scene of a traffic crash or medical emergency, the Working Group panel of experts believes that the safety of such transportation will be greatly improved.

### The [Draft] Recommendations

The recommendations for the safe transportation of children via emergency ground ambulances from the scene of a traffic crash or medical emergency are presented as follows to address five situations:

<b>Situation 1</b>	<b>For a Child who is uninjured / not ill</b>
<b>Situation 2</b>	<b>For a Child who is ill and/or injured and whose condition <i>does not require</i> continuous and/or intensive medical monitoring and/or interventions</b>
<b>Situation 3</b>	<b>For a Child whose condition <i>requires</i> continuous and/or intensive medical monitoring and/or interventions</b>
<b>Situation 4</b>	<b>For a Child whose condition <i>requires</i> spinal immobilization and/or lying flat</b>
<b>Situation 5</b>	<b>For a Child or Children who <i>require</i> transport as part of a multiple patient transport (newborn with Mother, multiple children, etc.)</b>

On occasion, one of the above situations may present the circumstance where an uninjured child or children may need to be transported from the scene of an emergency in order to ensure appropriate adult supervision to the uninjured child or children, and/or to provide for family continuity. The Working Group recommends that all EMS systems use this document and its recommendations and “pre-plan,” i.e., plan in advance for those situations events where infants and children may be on the scene - as primary patients or not - so such events can be successfully mitigated. Pre-planning for such events must also involve other public health, public safety and other partners to be most successful.

Some situations EMS systems and their partners need to pre-plan for are:

1. Injured or ill parents, guardians or caregivers who need to be transported to definitive care, with uninjured and well infants and/or children on the scene.

2. Multiple patient events involving infants and/or children who need to be transported (to include labor with the mother and one or more newborns).

Addressing and planning for these situations in advance will better prepare and protect EMS personnel and their agencies and other public safety personnel, patients, family members and the general public. Regardless of what type of vehicle is used in these situations, an age/size-appropriate child restraint system that complies with FMVSS 213 must always be used. Generally speaking, when the number of patients exceeds the ability to provide adequate care with existing EMS personnel and emergency ground ambulances, or to secure child patients as described in the following recommendations, EMS personnel need to request additional transportation resources that can respond in a timely manner.

**“The Ideal”** is the ultimate goal for safely and appropriately transporting children in emergency ground ambulances, and is presented in **bold** as the first recommendation for transporting a child in each of the five situations. “If the Ideal is not Practical or Achievable” is also provided in each of the five situations—this recommendation provides guidance to EMS professionals for the safe transportation of children if the Ideal can not be achieved. For the situation involving the transportation of a child who is uninjured and/or not ill, a third recommendation for safely transporting the child, “If Resources are Limited” is also presented.

Further, in addition to the guidance provided in the following recommendations, it is the consensus of the Working Group that **it is *not* appropriate to transport children, even in a child restraint system, on the multi-occupant squad bench located in the rear of ground ambulances.**

Appendix C, General Considerations and Selecting Child Restraint Systems for Ground Ambulance Transport, provides guidance to EMS providers for identifying equipment that may be used to meet the requirements of each of the recommendations. EMS providers are encouraged to check with equipment manufacturers for detailed information on the proper use and installation, results of crash testing, and possible limitations of any equipment that is obtained for the purposes of fulfilling the recommendations for the safe transportation of children in emergency ground ambulances.

Transportation of children in convertible child restraint systems or on car beds on an ambulance cot may be appropriate in some circumstances. Instructions for selection of equipment for this purpose and the installation are provided in Appendix D.

<b>Situation 1</b> <b>For a Child who is uninjured / not ill <sup>13</sup></b>	
<b>The Ideal</b>	<b>Transport using a size-appropriate child restraint system that complies with FMVSS 213 in a vehicle other than a ground ambulance.</b>
If the Ideal is not Practical or Achievable	<ol style="list-style-type: none"> <li>1. Transport in a size-appropriate child restraint system that complies with FMVSS 213 appropriately installed in the front passenger seat (with air bags off) of the emergency ground ambulance; or</li> <li>2. Transport in the forward-facing EMS provider’s seat (currently rare in the industry) in a size-appropriate child restraint system that complies with FMVSS 213 inside ambulance; <sup>14</sup>or</li> <li>3. Transport in the rear-facing EMS provider’s seat in a size-appropriate child restraint system that complies with FMVSS 213 (convertible or combination seat but not infant only seat, using a forward facing belt path) or in an integrated child restraint system seat (certified by manufacturer) to meet the injury criteria FMVSS 213; or</li> <li>4. Consider delay<sup>15</sup> of transport of the child with appropriate adult supervision until additional vehicles are available (patient is transported in EMS vehicle separately); or</li> <li>5. Per the judgment of EMS personnel on the scene (and in consultation with medical control, when possible), consider delay of transport (to the extent the patient’s safety and medical condition are not in any way compromised), patient care continued on scene (monitoring) until an additional vehicle is available for transport.</li> </ol>

<sup>13</sup> Please consult Appendix C, General Considerations and Selecting Child Restraint Systems for Ground Ambulance Transport, for guidance on how to select equipment that may be used to meet the requirements of each of the recommendations. EMS providers are encouraged to check with equipment manufacturers for detailed information on the proper use and installation, results of crash testing, and possible limitations of any equipment that may be considered for use to fulfill the recommendations for the safe transportation of children in emergency ground ambulances.

<sup>14</sup> There may be considerations of adding specific conditions for this use, e.g., crash tested seat meeting FMVSS 213 and adequate space in front of the seat.

<sup>15</sup> The Working Group recommends that all EMS agencies plan, in advance, with other public health, public safety, and other partners for those situations where uninjured or not ill infants and children may be on the scene - as primary patients or not - so such events can be successfully mitigated and the uninjured infants and children can be transported as safely and as quickly as possible.

<b>Situation 2</b> <b>For a Child who is ill and/or injured and whose condition <i>does not</i> require continuous and/or intensive medical monitoring and/or interventions <sup>16</sup></b>	
<b>The Ideal</b>	<b>Transport child in a size-appropriate child restraint system that complies with the injury criteria of FMVSS 213—secured appropriately on cot<sup>17</sup>.</b>
If the Ideal is not Practical or Achievable	1. Transport child in the EMS provider’s seat in a size-appropriate child restraint system that complies with the injury criteria of FMVSS 213 or an integrated seat in the EMS provider’s seat that is certified by the manufacturer to meet the injury criteria of FMVSS 213; or  2. Transport child on cot <sup>18</sup> using three horizontal restraints across the child’s torso (chest, waist, and knees) and one vertical restraint across each of the child’s shoulders.

<sup>16</sup> See Footnote 13.

<sup>17, 18</sup> All children transported on a cot shall be restrained to the cot with the 5-point cot restraint system that includes three horizontal restrains across the torso (chest, waist, and knees) and one vertical restraint across each shoulder.

<b>Situation 3</b> <b>For a Child whose condition requires continuous and/or intensive medical monitoring and/or interventions<sup>19</sup></b>	
<b>The Ideal</b>	<b>Transport child in a size-appropriate child restraint system that complies with the injury criteria of FMVSS 213—secured appropriately on cot<sup>20</sup>.</b>
If the Ideal is not Practical or Achievable	Secure the child to the cot <sup>21</sup> ; head first, with three horizontal restraints across the torso (chest, waist, and knees) and one vertical restraint across each shoulder. If the child’s condition requires medical interventions, which requires the removal of some restraints, the restraints should be re-secured as quickly as possible as soon as the interventions are completed and it is medically feasible to do so. In the best interest of the child and the EMS personnel, the vehicle operator is urged to consider stopping the ambulance during the interventions. If spinal immobilization of the child is required, see the recommendation in the following table.

<sup>19</sup> See Footnote 13.

<sup>20</sup> See Footnotes 17 and 18.

<sup>21</sup> Ibid.

<b>Situation 4</b> <b>For a Child whose condition requires spinal immobilization and/or lying flat<sup>22</sup></b>	
<b>The Ideal</b>	<b>Secure the child to a size-appropriate spineboard and secure the spineboard to the cot<sup>23</sup>, head first, with a tether at the foot (if possible) to prevent forward movement. Secure the spineboard to the cot<sup>24</sup> with three horizontal restraints across the torso (chest, waist, and knees) and a vertical restraint across each shoulder.</b>
If the Ideal is not Practical or Achievable	Secure the child to a standard spineboard with padding added, as needed, (to make the device fit the child) and secure the spineboard to the cot <sup>25</sup> , head first, with a tether at the foot (if possible) to prevent forward movement. Secure the spineboard to the cot <sup>26</sup> with three horizontal restraints across the torso (chest, waist, and knees) and a vertical restraint across each shoulder.

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<sup>22</sup> See Footnote 13.

<sup>23</sup> See Footnotes 17 and 18.

<sup>24</sup> Ibid.

<sup>25</sup> Ibid.

<sup>26</sup> Ibid.

<b>Situation 5</b> <b>For a Child or Children requiring transport as part of a multiple patient transport (newborn with Mother, multiple children, etc.)<sup>27</sup></b>	
<b>The Ideal</b>	<p><b>If possible, for multiple patients, transport each as a single patient according to the guidance shown for Scenarios 1 through 4.</b></p> <p><b>For mother and newborn, transport the newborn in an approved size-appropriate child restraint system that complies with the injury criteria of FMVSS 213 in the rear facing EMS provider seat with a forward-facing belt path that prevents both lateral and forward movement (convertible or integrated child restraint system and not an infant only seat), leaving the cot<sup>28</sup> for the mother.</b></p>
If the Ideal is not Practical or Achievable	<p>When available resources prevent meeting the criteria shown for situations 1 through 4 for all child patients, including mother and newborn, transport using space available in a non-emergency mode, exercising extreme caution and driving at reduced (i.e., below legal maximum) speeds.</p> <p>If additional units may be needed based upon preliminary reports, backup units should be put on standby.</p>

<sup>27</sup> The Working Group recommends that all EMS systems “pre-plan”, i.e., plan in advance for those situations where multiple infants and children may be on the scene - as primary patients or not - so such events can be successfully mitigated. Pre-planning for such events must also involve other public health, public safety and other partners to be most successful. An example of such an event is one that involves multiple patients, i.e., infants and/or children who need to be transported (to include labor with the mother and one or more newborns).

<sup>28</sup> All children transported on a cot shall be restrained to the cot with the 5-point cot restraint system that includes three horizontal restraints across the torso (chest, waist, and knees) and one vertical restraint across each shoulder.

## **Limitations of the Recommendations**

As stated previously, the major goal of this project is “to provide consistent national recommendations that will be embraced by local, State and national emergency medical services (EMS) organizations, enabling them to reduce the frequency of emergency transport of ill, injured or uninjured children in an unsafe or inappropriate manner.” The most critical aspect of this goal is *consistency*. As reported in the literature review, an examination of existing guidelines, protocols or standards reveals that while over the years States, localities, associations and EMS providers have developed legislation, guidelines or protocols regarding this issue, standards vary across jurisdictions and often provide limited, or in some cases inappropriate, guidance. It is hoped that the recommendations provided in this report will address the lack of consistent standards or protocols among EMS and CPS professionals in the U.S. regarding how to most safely transport children in ground ambulances from the scene of a traffic crash or medical emergency to a hospital or other facility.

In developing the recommendations and as was noted elsewhere in this report, various issues related to ambulance safety and equipment safety are important for discerning between safe and unsafe methods of transporting children in emergency ground ambulances. However, it is outside the purview of this project to conduct the vast amount of engineering research, crash testing, and field work that would be required to evaluate and determine the effectiveness of ambulance vehicles and child restraint and medical equipment currently available and in use for the purposes of transporting children in emergency ground ambulances.

As such, it is important to note the limitations of the recommendations presented in this report. The deliberations that led to the development of these recommendations did not include efforts to:

- Evaluate the efficacy of one child restraint system over another;
- Address the unique transportation challenges of children with special health care needs;
- Address the special transportation requirements of neonates and children with complex medical problems;
- Conduct any field tests of solutions or equipment;
- Evaluate the crashworthiness of emergency ground ambulances; or
- Assess ambulance design.

Nevertheless, it is hoped that the detailed protocols provided by the recommendations presented in this report will greatly improve the safety of all children transported in emergency ground ambulances in the U. S.

## **Additional Recommendations Beyond the Scope of this Project**

The intent of the recommendations presented in this report is to significantly improve the safe transport of children in emergency ground ambulances. In the course of the deliberations of the Working Group which led to the recommendations, a number of important issues outside of the purview of this effort were identified. While these issues do not preclude improving the safe transportation of children in

emergency ground ambulances, the Working Group believes it is important their notation be made for further study by the appropriate governmental, medical, professional, or other entity(ies). These additional recommendations are presented below:

#### **Recommendations for Governmental and Other Entities to Consider**

- **Expedite efforts to enhance the National EMS Information System (NEMSIS) to collect detailed data on crashes involving emergency ground ambulances and their passengers of all ages and make these data available at the State and national level.**
- **Encourage State EMS Agencies to share data with the State Highway Safety Office(s) and NEMSIS by collaborating on modifications to or an exemption from the Health Insurance Portability and Accountability Act (HIPAA) of 1996 to facilitate the development of NEMSIS.**
- **Develop dynamic crash test standards for all seats and occupant restraint systems appropriate for use in the occupant compartment of emergency ground ambulances.**
- **Develop dynamic crash test standards for the structural stability and restraint of cots and other transport devices (including incubators) used for transporting children in emergency ground ambulances.**
- **Develop standards for child restraint systems that meet the unique medical needs during the transportation of term and pre-term neonates.**
- **Develop standards for child restraint systems that meet the medical needs of children with special health care and/or complex medical problems.**
- **Develop dynamic crash test standards for emergency ground ambulance construction.**

#### **Recommendations for Manufacturers to Consider**

- **Develop child restraint systems that meet or exceed the injury criteria for FMVSS 213 to accommodate child patients of various heights (or lengths including newborn/infant patients) for use in ground ambulances.**
- **Develop an integrated cot restraint system that meets or exceeds the injury criteria for FMVSS 213 to accommodate child patients whose conditions require continuous and/or intensive medical monitoring and/or interventions.**
- **Develop and provide instructions that improve correct ease of use of products designed for ambulance use.**

- **Develop crash-tested child restraint system(s) for use in the rear- or forward-facing EMS provider's seat of ground ambulances.**
- **Develop a forward facing dynamically tested EMS provider's seat that will accommodate convertible or rear facing only child restraint systems (and adult passenger with three point belt).**
- **Develop improved crashworthy methods of seating for all occupants in the rear of the emergency ground ambulance compartment.**

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**Appendix A**  
**NHTSA:**  
**Solutions to Safely Transport Children in Emergency Ground**  
**Ambulances**

**Literature Review Findings**

**May 28, 2009**

**Contract: DTNH22-08-C00085**



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## **Executive Summary**

In September 2008 the National Highway Traffic Safety Administration (NHTSA) initiated a project titled “Solutions to Safely Transport Children in Emergency Vehicles”. The objectives of this project are:

1. To initiate consensus building in the development of recommendations to safely and appropriately transport children (injured, ill, or uninjured) from the scene of a crash or other incident in a ground ambulance. Draft recommendations will be created after reviewing relevant research and the practices that are currently being used to transport children in ambulances.
2. To provide recommendations that will be embraced by local, state and national EMS organizations, enabling them to reduce the frequency of inappropriate emergency transportation of ill, injured or uninjured children.

A first step to achieving these objectives is the completion of a literature review of current practices for the emergency transportation of child passengers in ground ambulances. Emphasis includes research in professional journals and elsewhere that describes an ideal or model uniform approach to transport children safely in ambulances, as well as articles and publications that document unsafe or incorrect practices. It should be noted that throughout the remainder of this document, references to ambulances are limited to ground ambulances, unless otherwise noted.

The objective of this report is to provide representatives from the NHTSA with a summary of findings from the Literature Review. This document is designed to provide NHTSA representatives with an overview of the published research conducted to date regarding the safe transportation of children in emergency vehicles, primarily ambulances. This Literature Review Findings report will serve as a point of reference for consensus building efforts going forward.

During the course of the Literature Review, researchers from Maryn Consulting, Inc. (Maryn) reviewed several hundred pages of information related to ambulance safety issues and the transport of children in ambulances. Relevant sources were then organized by topic (i.e. statistical information, existing guidelines, current practices and outcomes, safety research, etc.). Once organized, researchers examined these sources in depth and recorded information relevant to this study. Finally, researchers analyzed this information and extracted key findings for inclusion in this Literature Review Findings document.

To aid in the review of this document Maryn has organized the summary findings by topic. Below is a list of the topics covered in this document:

**Background:** This section provides an overview of statistical findings and data sources specific to ambulance transport issues and child transport in ambulances. This section also references media coverage of the issue of child transport in ambulances.

**Ambulance Safety Issues:** This section provides an overview of ambulance safety issues in general, with references to research and publications regarding this topic.

Child Transport in Ambulances: Existing Guidelines: This section provides an overview of the current published guidelines regarding the safe transport of children in ground ambulances at the national and State levels, as well as those promulgated by relevant practitioner associations.

Child Transport in Ambulances: Current Practices and Outcomes: This section describes current trends in the transport of children in ambulances, and describes questions identified by practitioners regarding this topic.

Child Transport in Ambulances: Safety Research: This section provides an overview of engineering and safety research findings regarding safe and unsafe methods of transporting children in ground ambulances.

## **Background**

Data sources regarding ambulance crashes involving child ambulance occupants in the United States, as well as abroad, are limited. In the United States there is no single national Emergency Medical Services (EMS) dataset which can be analyzed to better understand the annual number of ambulance trips, those that involve children, the frequency of ambulance crashes, the victims or types of injuries associated with such crashes, or the causes of such crashes. At this time efforts are underway to develop a national EMS Information System (NEMESIS) to capture some of this data so as to better inform EMS related policy, protocols and practices.<sup>1</sup> Many States and private sector EMS providers also capture some of this information. However, these data are often not readily available or easily accessible.

Estimates suggest that ground EMS responds to approximately 30 million emergency calls each year.<sup>2</sup> Approximately 6.2 million patient transport ambulance trips occur annually,<sup>3</sup> of which approximately 10% of those patients are children.<sup>4</sup> Insurance companies report that approximately 10,000 ambulance crashes result in injury or death each year.<sup>5</sup> Estimates suggest that up to 1,000 ambulance crashes involve pediatric patients each year.<sup>4</sup> Occupational safety data indicate that “the transportation-related mortality rate for EMS personnel (per 100,000 workers) is 9.6, a rate that eclipses the national average (2.0) and exceeds that of police (6.1) and firefighters (5.7)”.<sup>6(p69)</sup>

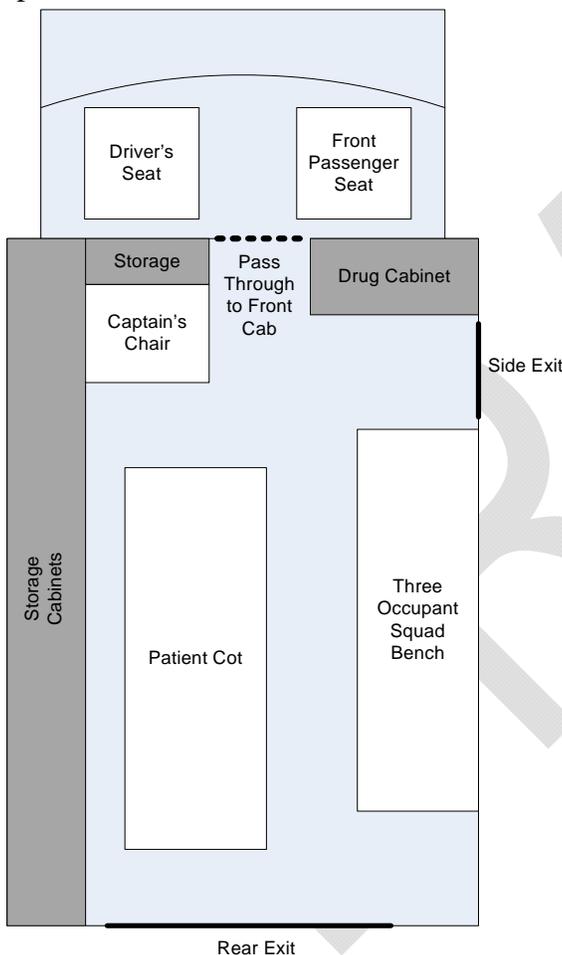
Some information regarding ambulance crashes can be learned from analyses of NHTSA’s Fatality Analysis Reporting System (FARS) data. However, it should be noted that these data do not capture crash information unless that crash results in a fatality. A research article published in 2006 examining the specific issue of ambulance crashes utilized FARS data reported between 1987 and 1997 to find that 339 ambulance crashes resulted in 405 fatalities and 838 injuries. These fatalities and injuries include those involving ambulance drivers and passengers, as well as other vehicle drivers and passengers, in addition to pedestrians and bicyclists.<sup>6</sup>

An examination of 2007 FARS data, the most recent available to date, indicates that three fatal ambulance crashes reported that year involved children present in the ambulance. In one case the child was not injured; in two cases the children suffered minor injuries.<sup>7</sup> Because FARS data do not include all ambulance crashes, it is estimated that the number of children injured in ambulance crashes that do not result in fatalities is significantly higher than numbers reflected in FARS (see above). Additional analysis of the FARS data indicates that in 2007 there were 29 fatal ambulance crashes which involved

82 people, including ambulance drivers and passengers, as well as other vehicle drivers and passengers, in addition to pedestrians and bicyclists. Data suggest that during that year 34 individuals in the rear compartments of ambulances were involved in these fatal accidents.<sup>7</sup>

A review of local, national, and international media coverage of ambulance crashes involving injuries to children suggests such crashes are dangerous. Articles in newspapers across the world, as well as televised news coverage at the local level, suggest ambulance crashes involve children of all ages and can result in injuries ranging from minor to fatal. Injured children may be patients or passengers accompanying a caregiver; they may be receiving transport from the scene of a crash, a medical emergency, or involved in an inter-facility transport.

Presently, there are no federal standards or protocols among EMS and child passenger safety professionals in the U.S. for how best to safely transport children in ground ambulances from the scene of a traffic crash or medical emergency to a hospital or other facility. There are unanswered questions regarding the placement and restraint of injured, ill, or uninjured children among EMS and CPS professionals. The absence of consistent national standards and protocols regarding the transportation of children in ground ambulances complicates the work of EMS professionals and may result in the improper restraint of highly vulnerable child passengers. EMS agencies, advocates and academicians have turned to NHTSA for leadership.



**Figure 1: Ambulance Rear Compartment**

effects of ambulance crashes on patients, passengers, ambulance drivers and medical technicians, as well as other vehicle drivers, passengers and pedestrians. Findings indicated that while “wearing a passenger restraint device was highly significant and protective”,<sup>8(p1490)</sup> the use of passenger restraints among

Lastly, it should be noted that when reviewing existing data, professional articles, and protocols, as well as media coverage of this issue, the definition of a “child” is not always consistent, or consistently addressed. In many cases a focus on very young children can be inferred from the context of the article or protocol, but a uniform definition of child has not been developed for the purposes of emergency ambulance transport.

### Ambulance Safety Issues

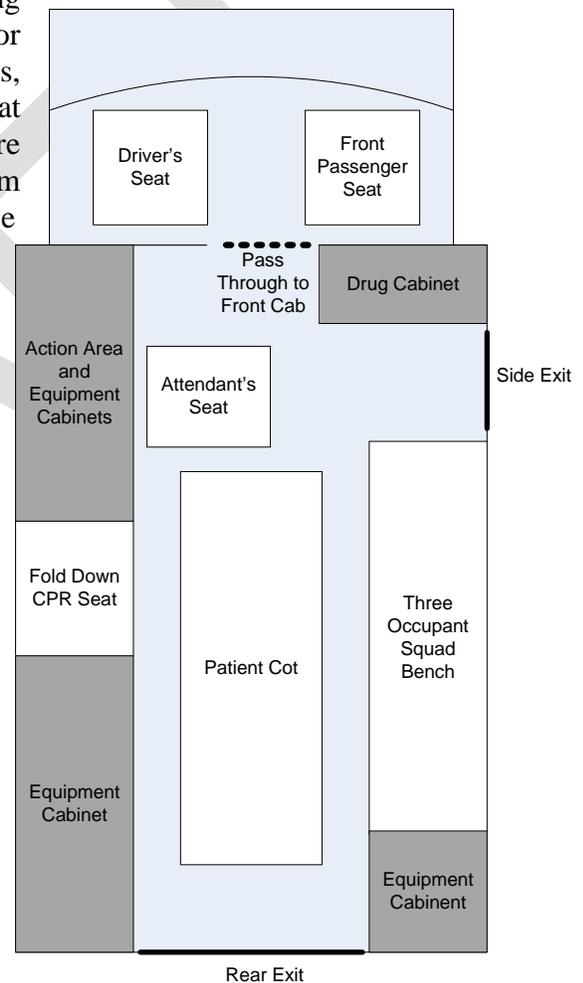
In 1987, a group of researchers reported on an examination of 102 ambulance crashes in Tennessee in one of the first published efforts to better understand the causes and

patients, technicians and drivers was not common. Additional findings suggested that the risk of an “injury-accident” increased during nighttime and at intersections.<sup>8 (p1487)</sup>

A more comprehensive study examining the characteristics of fatal ambulance crashes across the country between 1987 and 1997 found that ambulance crashes “occurred more often between noon and 6PM...through an intersection...and striking another vehicle.” Inside the ambulance, the “most serious and fatal injuries occurred in the rear ... and to improperly restrained occupants.”<sup>9(p261)</sup> These findings regarding injuries to ambulance occupants are supported by similar research examining the characteristics of ambulance crashes.<sup>10</sup>

Subsequent research conducted during the early 2000s examined ambulance crashes, and compared ambulance travel to travel in other motor vehicles. Findings suggest that travel in ambulances is less safe than travel in other motor vehicles for all passengers, including patients. A study conducted in Pennsylvania, comparing motor vehicle crashes involving ambulances and similarly sized vehicles, revealed that “ambulance crashes occur more frequently at intersections and traffic signals and involve more people and more injuries than those of similar sized vehicles”.<sup>11(p412)</sup> Findings from another study utilizing national data suggest that “relative to police cars and fire trucks, ambulances experienced the highest percentage of fatal crashes where occupants are killed and the highest percentage of crashes where occupants are injured.”<sup>10(p941)</sup> It should be noted that while ambulance crashes are dangerous for ambulance occupants, data suggest that individuals in other vehicles, pedestrians or bicyclists are significantly more likely to be injured or killed as a result of an ambulance crash than the ambulance occupants themselves.<sup>9</sup>

From an occupational safety perspective, research suggests that ambulance design may inhibit the use of safety restraints by emergency medical technicians. In order to perform certain clinical tasks, such as administering oxygen or performing CPR, paramedics may require different positioning than that permitted by the use of restraints in either the Captain’s Chair or a side bench.<sup>12</sup> More generally, research suggests that ambulance crashes are the most common cause of work-related fatalities among EMS workers.<sup>2</sup> Figures 1 and 2 are diagrams of common rear compartment designs of ambulances.<sup>13</sup>



**Figure 2: Ambulance Rear Compartment**

Safety standards regarding the EMS transport environment are limited, both in the United States and internationally. In the United States, federal purchase specifications for ambulances are defined in a document published by the U.S. General Services Administration (GSA), *Federal Specifications for the Star-of-Life Ambulance*.<sup>14</sup> These specifications require that ambulances purchased by federal government agencies

meet applicable Federal Motor Vehicle Safety Standards, specifically those addressing braking requirements, fuel systems, lights, reflective devices, door latches and hinges, as well as Emergency Medical Services Provider (EMSP) seating and patient compartment seating. All seating positions, in the front and rear ambulance compartments, must be equipped with seat belts. The USA ANSI/ASSE Z15.1 fleet management standard, published in March 2006, now applies to EMS fleets. This standard applies to a wide variety of fleet and non-fleet vehicles and requires organizations to have a policy in place pertaining to the use of seat belts, and recommends, but does not require, mandatory seat belts be used on behalf of a business or an organization.<sup>15</sup>

It should be noted that the designs of rear compartments of ambulances vary widely. Figures 1 and 2 depict typical ambulance designs, but many ambulances may vary in the placement of cots, cabinets, and squad benches as well as the type of pass through to the front cab.

### **Child Transport in Ambulances: Guidelines**

As EMS practitioners encounter a situation requiring the emergency transport of a child in an ambulance, limited guidance is available. In order to identify the best method of restraint, a practitioner must consider the age and stature of the child, if that child is injured or is an accompanying passenger, the medical stability of the patient, and the available locations where the child can be safely restrained inside the ambulance. The wide variation of potential scenarios presents challenges to EMS practitioners.

An examination of existing guidelines, protocols or standards reveals that while over the years States, localities, associations and EMS providers have developed legislation, guidelines or protocols regarding this issue, standards vary across jurisdictions and often provide limited, or in some cases inappropriate, guidance. As discussed earlier, there are no federal standards or protocols among EMS and child passenger safety professionals in the U.S. for how best to safely transport children in ground ambulances from the scene of a traffic crash or medical emergency to a hospital or other facility.

This issue of variation in emergency child transport guidelines was first identified in a 1998 publication which reported the results of a survey examining State requirements regarding the use of safety restraints for children in ambulances. The study revealed that 35 States did not require patients of any age to be restrained in ambulances. Of those States requiring the use of child safety restraints, requirements varied between requiring restraint on a gurney, in a child seat, or both. Variation across States in the definition of a “child” ranged from individuals under the age of four to individuals under the age of 21. At that time the State agencies responsible for the regulation of ambulance services in each State varied as well. Responsible agencies included State EMS, law enforcement, and public safety agencies, as well as Departments of Transportation and Motor Vehicles. Fourteen States did not regulate EMS services. In some States, multiple agencies were involved in the regulation of ambulance safety.<sup>16</sup> This study also noted that at that time “the exact method to safely secure infants and smaller children in ambulances has ... not been well conceived.”<sup>16(p223)</sup> Among other recommendations, the authors suggested that a universal age definition of pediatric patient be established, “a method for safely securing infants and children in ambulances...be developed”, and that “biomechanical research on ambulance safety and crashes...be undertaken.”<sup>16(p223)</sup>

One year after the publication of these State survey findings, the Health Resources and Services Administration (HRSA) Emergency Medical Services for Children program (EMS-C) and NHTSA convened a national consensus committee to review EMS child transportation safety practices. This group of representatives from EMS national organizations, federal agencies, and transportation safety engineers developed a document titled *The Dos and Don'ts of Transporting Children in an Ambulance*, which was published in December 1999. This document provides very general guidance for practitioners in the field regarding how to most safely transport children in an ambulance. In addition to recommendations specific to safe emergency driving, guidance also includes the following recommendations:

- *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 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 NHTSA Emergency Vehicle Operating Course (EVOC), National Standard Curriculum, or its equivalent.*

This document does not define “child” with regards to age or stature. The document also states that through grant funds, researchers are “working to fill critical knowledge gaps and developing standards for pediatric EMS transport safety.”<sup>17</sup> However, to date, the federal government has not published more specific guidance.

Since the publication of this *Dos and Don'ts* document, States, localities, and private EMS providers across the country have developed guidelines that include similar information for internal operations. Utilizing safety research published in 2001, some of these guidelines are more detailed than the *Dos and Don'ts* document (see pp. 7-8). However, there is limited uniformity across these publicly and privately promulgated guidelines.

Despite the publication of *Dos and Don'ts* by the federal government, and the development of moderately more detailed guidelines across the country, EMS practitioners continue to struggle with unanswered questions. In many cases, the issue of age or stature is not addressed. As discussed above, some of the recommended practices are conflicting, others are impractical, and others may be insufficiently detailed to provide useful guidance. For example, a State EMS requirement to restrain all child passengers may result in the placement of a child in a car seat strapped to a side-facing bench in the rear compartment of an ambulance, rather than the captain's seat. The use of a child restraint in such a fashion is prohibited by all child restraint manufacturers. In addition, safety researchers conclude it “is not recommended, because this usage applies the severity of a frontal impact to the less protected side-

facing child.”<sup>18(p356)</sup> In this example, more specific guidance regarding the placement of a child in a side-facing position is required.

It should be noted that more focused research and detailed guidance has been developed for specialized ambulance services providing inter-facility transport of children between hospitals and other care facilities.<sup>19</sup> Due to the specific population focus of these vehicles, these ambulances are typically more appropriately equipped for pediatric transport. Lessons derived from this body of work may inform the efforts to better guide EMS practitioners with regards to emergency child transport. Similarly, standards for the transport of pediatric patients in air ambulances may offer guidance regarding safe protocols for child restraint, particularly injured patients.

### **Child Transport in Ambulances: Current Practices and Outcomes**

Given the limited and sometimes conflicting guidance provided at the federal, State and local levels, actual emergency child transport practice in ground ambulances varies dramatically. Academic research, as well as anecdotal information published in practitioner publications, suggests that there is confusion or ambiguity regarding the safe transport of children in ambulances. Actual practices and protocols are often inconsistent. EMS provider training often omits specific discussions of pediatric emergency transport. In many cases, appropriate equipment may be unavailable, leaving the provider to improvise without clear guidance.

In 2000 the results of a study examining the knowledge, opinions and behaviors of EMS personnel regarding child and provider restraint use in ambulances were published. This study involved surveying EMS providers in a midsized urban area and based its analyses on published safety research that was available at that time, including the *Dos and Don'ts* document. Findings indicated that large percentages of EMS providers did not correctly indicate the safest method of transporting a 2-year-old child (30%) or correctly securing a child seat to an ambulance cot (40%). This study also indicated that although a significant majority (80%) of EMS providers regularly transports children in car seats, approximately 23% of providers reported that they occasionally transport children in adult laps. Additionally, 70% of EMS providers reported not utilizing seatbelts themselves on the squad bench, with 55% indicating that utilizing restraints impairs their ability to provide patient care. Not surprisingly, this study also found that specialized emergency pediatric transport services personnel responses more often correctly identified the safest methods of emergency child transport.<sup>20</sup>

Findings from the 2000 research publication are supported by similar findings from previous examinations of emergency child transport practices, and anecdotal evidence. The observation of approximately 200 ambulance hospital arrivals involving children under 14 in a midsized urban area in 1999 suggested that children were transported without restraints on the side-bench (squad bench seat), in the Captain's Chair, or in an adult's lap approximately 37% of the time. An additional 5% were transported without restraints on the ambulance gurney (patient cot).<sup>21</sup> Publications for EMS practitioners, including journals and newsletters, also refer to the common practices of allowing stable child patients to travel in the laps of adults, and strapping children to cots utilizing the cot belt systems that are designed for adult patients.<sup>4,22</sup>

A lack of clear guidelines and consistent training results in these varied practices. In addition, the dynamic nature of emergency medicine requires that solutions take into consideration numerous potential scenarios. The EMS community has identified the following issues related to emergency pediatric transport that remain unresolved:

- *Utilizing a child's own convertible car seat (that has been involved in a crash) properly restrained in the ambulance or transferring the child to a different car seat or car bed for proper restraint in the ambulance*
- *How to handle child crash victims in car seats that are not convertible models when injuries may be aggravated by transferring them to another method of restraint in the ambulance*
- *Validation of ambulance-specific test procedures for car seats*
- *Utilizing a convertible car seat contrary to manufacturer instructions*
- *Not all ambulance gurneys have the latest, strongest anchorages to the vehicle floor<sup>22</sup>*

NHTSA has issued a general position statement regarding the reuse of a child restraint that has been involved in a crash. The NHTSA position is that child restraints may be reused after involvement in a “minor” crash; one of the criteria in the definition of “minor” is that no vehicle occupants are injured.<sup>23</sup> Given that the transport of a child from a crash in an ambulance typically is associated with an injury, either to the child or his/her caregiver, the NHTSA position does not directly address the first issue noted above by the EMS community.

Despite these identified unresolved emergency child transport questions and the potential for child injury in the rear compartment of an ambulance, a review of legal cases in Westlaw suggests that very few, if any, legal cases involve the improper or lack of restraint of child passengers in the rear compartment of a ground ambulance.

### **Child Transport in Ambulances: Safety Engineering Research**

Very limited safety engineering research has been conducted to identify the safest methods of transporting children in ambulances. However, the principles of child and patient restraint are useful in developing recommended protocols and practices for child restraint in ground ambulances, as well as guiding safety research and crash testing activities. Existing safety engineering research on this issue focuses on younger children, primarily those six and under.

In 2001, Dr. Marilyn Bull, with her colleagues from the Indiana University School of Medicine and the University of Michigan, conducted ambulance crash tests to specifically examine safety outcomes when utilizing convertible car seats, car beds and harness systems, with 3-year, infant and 6-year size dummies. The published results are summarized below:

*A two-belt attachment with elevated cot backrest was found to be the method with the least performance variability for securing either a convertible child restraint or a car bed. It was concluded that children who weight up to 18 kg, fit in a convertible child restraint, and can tolerate a semi-upright seated position can be restrained in a convertible child restraint secured with two belts to an ambulance cot. Infants who*

*must lie flat can be restrained in a car bed modified for two seatbelt paths and secured to a cot. In each case, the cot backrest must be elevated, and the cot and anchor system must be crashworthy. None of the harness configurations tested proved to be satisfactory, but an effective system could be developed by following accepted restraint design principles.*<sup>18(p353)</sup>

In addition to discussing the findings of the specific crash tests conducted by this team of researchers, this study also provides an overview of safety issues involved with the use of restraints for children in other locations within the rear ambulance compartment. The authors suggest it may be possible on some occasions to restrain a child or infant in the rear-facing Captain's Chairs (technician's seats). Some child restraint manufacturers may provide instructions for the installation of a convertible car seat in this seat. Additionally, many of these seats are now equipped with a built-in child restraint that is acceptable for use with an uninjured or less critically injured child (not an infant). However, the authors note, the utilization of the technician seat for a child prohibits the use of that seat for emergency medical personnel. The placement of a child in a car seat strapped onto the side bench in the rear compartment of the ambulance is prohibited by all car seat manufacturers and "is not recommended, because this usage applies the severity of a frontal impact to the less protected side-facing child".<sup>18(p356)</sup> As discussed above, the use of harnesses on the patient cot for a younger child is not crashworthy. Lastly, a child held by a properly restrained adult is not appropriate restraint.

The "Conclusions and Recommendations" section of this study has been widely circulated within the EMS community. States, localities, EMS providers, and practitioner associations have incorporated Dr. Bull's recommendations into protocols and guidelines for EMS practitioners.<sup>24,25,26</sup> However, as Dr. Bull and her colleagues noted in their findings, these tests were completed utilizing a newer cot and anchor system with a "slide-in track to hold the cot firmly to the ambulance floor".<sup>18(p356)</sup> This system is often not found in older ambulance models. Crash tests conducted in 1998 found that this older type of cot and fastener "did not provide a secure platform for the child restraint."<sup>18(p356)</sup> Therefore, the findings of the 2001 study may not provide the same degree of protection for child transport when older cot and anchor systems are used but may improve safety even in those circumstances in less severe crashes.

Also in 2001, Dr. Nadine Levick, who was affiliated with Columbia University, and colleagues from the U.S. Center for Transportation Research and the Naval Air Warfare Center at Patuxent River, conducted ambulance crash tests which examined more general dynamics inside the rear compartment of an ambulance during a crash. These tests included a 3-year old size dummy restrained in a convertible car seat strapped to an ambulance cot in the same manner described in the child restraint crash test. Additionally, three adult dummies of varying sizes, and medical equipment typically found inside the rear ambulance compartment, were involved in the crash tests. Results suggest that the restraint method utilized for the child was effective. However, unrestrained ambulance occupants in the rear compartment impacted the restrained child during the crash, presenting the opportunity for significant injury to the child.<sup>27</sup> Findings emphasized that patient safety depends upon the utilization of safety restraints by all ambulance passengers, and the appropriate securing of all equipment in the rear ambulance compartment.

## **Conclusion**

Although limited research has focused on the specific issue of the emergency transport of children in ambulances, more information has become available since EMSC/NHTSA's publication of *The Dos and Don'ts of Transporting Children in an Ambulance*. Given the lack of a universal definition of "child", as well as the inconsistent protocols and practices currently utilized by EMS practitioners, additional guidance, developed by topical experts, would improve the safety of all children transported in ambulances in the United States.

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**Appendix B**  
**Agenda and List of Participants, Meeting of the Working Group**  
**EMS Solutions for Safely Transporting Children in Emergency Vehicles**  
**July 22, 2009**  
**Washington DC**

**Agenda**

8:00 to 8:15 Sign In & Refreshments

8:15 – 9:00 Welcome Drew Dawson / Sandy Sinclair  
Introductions Valerie Boykin  
House Keeping / Logistics  
Work Group Overview / Activities Update

**Topical Discussions**

9:00 – 9:30 Final Product Hassan Aden  
Who is the audience?  
What type of product will be most useful?  
What should it look like?

9:30 – 10:00 Definition of Child Delmas Johnson  
Should age and / or stature be considered in developing our recommendations?  
Should we use previously established age categories?

10:00 – 10:15 Break

10:15 – 11:15 Tour / Demo of Ambulance and Equipment  
Dr. Joe Wright and Tom Stotz  
Cyndy Wright-Johnson

11:15 – 11:45 Crash Protection For Children In Ambulances  
Dr. Marilyn Bull

11:45 – 12:00 NHTSA's 4 Steps For Kids Recommendations  
Sandy Sinclair

12:00 – 1:00 Working Lunch

Evaluate / Discuss Standard Ambulance Equipment (Small Group Discussions)

Identify key issues / considerations / recommendations

- Transport Equipment
- Securing of Emergency Medical Equipment

1:00 – 3:00 Hierarchical Approach / Establishment of Benchmarks

- Car Seats
- Side Facing Passengers

3:00 – 3:30 Wrap Up / Next Steps / Reimbursements

- NHTSA Representatives
- Valerie Boykin
- Amy Wilson

### **Meeting Attendees**

#### **Workgroup Members**

Name	Organization
Katrina Altenhofen	National Association of State Emergency Medical Services Officials
Dr. Marilyn Bull	The American Academy of Pediatrics
Dr. James Callahan	American College of Emergency Physicians
Dr. Andrew Garrett	National Association of Emergency Medical Service Physicians
Ken Knipper	National Volunteer Fire Council
Tommy Loyacono	National Association of Emergency Medical Technicians
Dr. John Russell	American Ambulance Association
Dr. Joseph Wright	National Emergency Medical Services for Children Resource Center
Cyndy Wright-Johnson	Emergency Nurses Association

**NHTSA**

<b>Name</b>	<b>Organization</b>
Sandy Sinclair	Occupant Protection/TIC & Contracting Officer's Technical Representative for the Project
Dave Bryson	EMS/Traffic Injury Control (TIC)
Drew Dawson	EMS/TIC
Thelma Kuska	Region 5

**Maryn Consulting, Inc.**

<b>Name</b>	<b>Organization</b>
Hassan Aden	Alexandria Police Department / Maryn Consultant
Valerie Boykin	Project Manager
Delmas Johnson	Sr. Consultant
Greg Maryn	President
George Perkins	Business Development Manager
Amy Wilson	Operations and Administration Manager

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## Appendix C

### General Considerations and Selecting Child Restraint Systems for Ground Ambulance Transport

#### General Considerations:

- All ground ambulances transporting children should have seats and restraints capable of safely securing children. These can be in the form of either a single system or multiple restraints as long as all sizes are accommodated.
- Child restraints should only be attached to ambulance seats that have been successfully crash tested to FMVSS 208 standards in the position that they are mounted in the ambulance. Swiveling seats should be tested in every position in which they are able to be locked when a child restraint is present.
- While there is currently no U.S. testing standard for ambulance cots, every effort should be made to ensure that the ambulance is equipped with a cot and fastener system that has been successfully tested under vehicle crash conditions of at least 10g.
- *Child restraints should never be attached to a side facing seat or bench seat unless both the child restraint manufacturer and the adult seat manufacturer can provide documentation of third party testing proving their seat meets or exceeds the standards for test pulse and anthropomorphic test dummy (ATD) injury criteria specified in FMVSS 213 (for the child restraint) and FMVSS 208 (for the adult seat) in a side facing position.*

#### Selecting Child Restraints for EMS:

There are many child restraint options available to EMS agencies. These may include (but are not limited to): integrated seats, conventional child restraint systems for use in motor vehicles, cot mounted devices, board and harness systems, etc. Due to the lack of regulation and testing requirements specific to ground ambulances, many of the available devices may be designed for a different use and either tested to automotive standards or not tested at all. It is not in the purview of this document to recommend any specific product, but it is possible to categorize products based on design and testing characteristics. Ideally, this will provide EMS agencies with some criteria that should correlate to the safety and efficacy of the child restraint system they are considering. They are listed below with “A” being the best option and “D” the worst. It is important to remember that even “D” is much better than transporting a child unrestrained or held in an adult’s arms.

#### Category A:

- Seats and restraints specifically designed to either be permanently mounted in a ground ambulance or secured on a rear facing cot or seat.
- Seats and restraints will be dynamically tested in the same configuration as they are expected to be used in the ground ambulance; either directly mounted or secured in actual ambulance seats or cots. Testing using FMVSS 213 forward facing test sled is not acceptable.

- 
- Manufacturer can provide documentation of third party testing proving their seat meets or exceeds the standards for test pulse and ATD injury criteria specified in FMVSS 213. Documentation must be provided proving compliance in a rear facing test for both infant and child seat configurations (if applicable). Must also be tested forward facing for children over two years old if allowed to be installed in a swiveling seat. Computer modeling or testing is not acceptable.

### **Category B**

- Devices in this category are proven to be safely secured based on at least one published and peer reviewed study. Must meet all the following criteria to ensure compliance:
  - Convertible child restraints for children up to 40 pounds and infant car beds for infants up to 20 pounds that are designed for passenger cars/trucks and are FMVSS 213 tested and certified. Computer modeling or testing is not acceptable.
  - Restraint system must be able to be attached to cot or seat using two belt paths to prevent both forward and rearward motion.
  - Ambulance seat or cot must have a belt and retractor system that allows for a secure, two path attachment of the restraint.
  - Amended instructions and training have been provided for correct mounting in a non-standard direction.

### **Category C**

- Seats and restraints other than those covered in Category B that may either be secured in a rear facing cot or seat and are FMVSS 213 tested and certified using a standard, forward facing test sled.

### **Category D**

- All other seats and restraints that are not FMVSS 213 tested and certified, or that the manufacturer cannot provide documentation that the seat or restraint meets or exceeds the standards for test pulse and ATD injury criteria specified in FMVSS 213.

## Appendix D

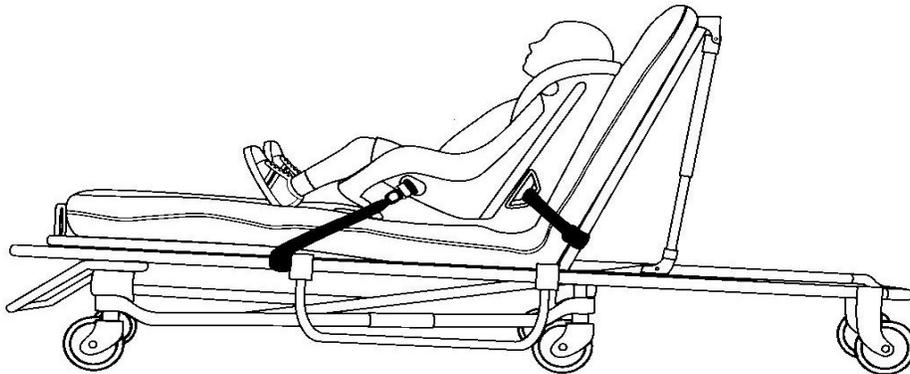
### Convertible Child Safety Seat and Car Bed Installation Recommendations

#### Convertible Child Safety Seat (CSS)

Child Size: 5 to 40 lbs

#### Installation Recommendations:

- Install with rear-facing & forward-facing belt paths
- Choose seat with 5-point internal harness
- Position seat facing rear of ambulance
- Elevate cot backrest to fully upright position
- Adjust restraint recline mechanism to fit snugly against cot backrest



## Appendix D (continued)

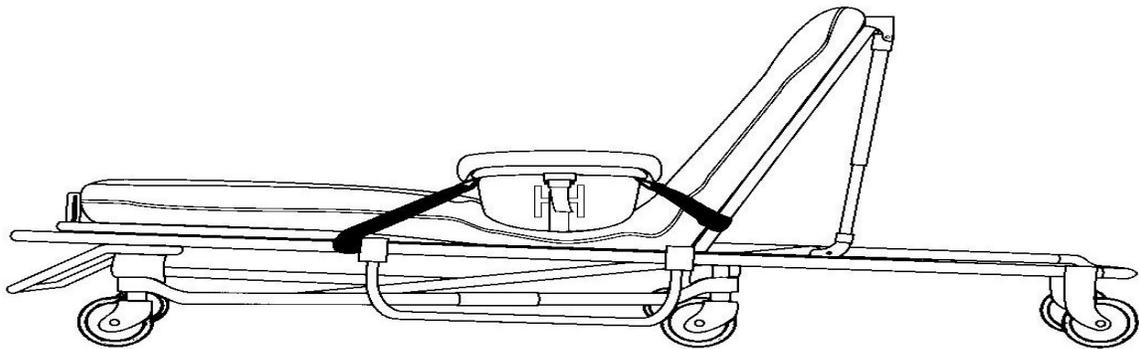
### Convertible Child Safety Seat and Car Bed Installation Recommendations

#### Car Bed

**Child Size:** 5 to 20 lbs

**Installation Recommendations:**

- Designed for infants who must lie flat
- Only use car bed with two belt systems
- Note: Second set of loops must be purchased from the manufacturer
- Elevate cot backrest to fully upright position
- Attach belts to cot where sliding minimized
- Position head away from side of vehicle



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**Appendix E**  
**Recommended Best Practices for Child Restraint System (CRS) Use**

**Shown on the following pages:**

**NHTSA's Child Passenger Safety: A Parent's Primer from**  
[www.nhtsa.gov/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/4StepsFlyer.pdf](http://www.nhtsa.gov/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/4StepsFlyer.pdf)

**The American Association of Pediatrics' Car Safety Seats: A Guide for Families 2010 from**  
[www.healthychildren.org/English/safety-prevention/on-the-go/pages/Car-Safety-Seats-Information-for-Families-2010.aspx](http://www.healthychildren.org/English/safety-prevention/on-the-go/pages/Car-Safety-Seats-Information-for-Families-2010.aspx)

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# Child Passenger Safety

## A PARENT'S PRIMER

When you're an expectant mother, it's important to always wear your seat belt to protect you and your unborn child. Wear the lap belt across your hips and below your belly with the shoulder belt across your chest (between your breasts). Once your baby is born, follow these important safety steps.

### GROWING UP SAFE: It's a four-step process.

As children grow, how they sit in your car, truck or SUV should change.

Save your child from injury or death by observing all four steps:

- 1 REAR-FACING SEATS**  For the best possible protection keep infants in the back seat, in rear-facing child safety seats, as long as possible up to the height or weight limit of the particular seat. At a minimum, keep infants rear-facing until a minimum of age 1 **and** at least 20 pounds.
- 2 FORWARD-FACING SEATS**  When children outgrow their rear-facing seats (at a minimum age 1 **and** at least 20 pounds) they should ride in forward-facing child safety seats, in the back seat, until they reach the upper weight or height limit of the particular seat (usually around age 4 and 40 pounds).
- 3 BOOSTER SEATS**  Once children outgrow their forward-facing seats (usually around age 4 and 40 pounds), they should ride in booster seats, in the back seat, until the vehicle seat belts fit properly. Seat belts fit properly when the lap belt lays across the upper thighs and the shoulder belt fits across the chest (usually at age 8 or when they are 4'9" tall).
- 4 SEAT BELTS**  When children outgrow their booster seats, (usually at age 8 or when they are 4'9" tall) they can use the adult seat belt in the back seat, if it fits properly (lap belt lays across the upper thighs and the shoulder belt fits across the chest).

## Get Help!

### ON THE WEB

Go to [www.nhtsa.gov](http://www.nhtsa.gov) and choose Child Safety Seat Information from the menu or click on the child passenger safety icon. The site includes child safety seat installation tips, product ratings, recalls, and other useful information.

### BY PHONE

For more information about child safety seats, booster seats, inspection/fitting stations in your area, seat belts, air bags, and

other highway safety issues, call the DOT Vehicle Safety Hotline at: 1-888-327-4236.

### NEAR YOU

A certified child passenger safety technician can check your installation and answer questions. To find a technician or an inspection station near you, go to [www.nhtsa.gov](http://www.nhtsa.gov), click on the child passenger safety icon, and then click on the Fitting/Inspection Station link or go to [www.seatcheck.org](http://www.seatcheck.org).

**REMEMBER: All children under 13 should ride in the back seat.**

Always read the child restraint instructions and the vehicle owner's manual.



[Healthy Children](#) > [Safety & Prevention](#) > [On The Go](#) > Car Safety Seats: Information for Families for 2010

## Safety & Prevention

### Car Safety Seats: Information for Families for 2010



One of the most important jobs you have as a parent is keeping your child safe when riding in a vehicle. Each year thousands of young children are killed or injured in car crashes. Proper use of **car safety seats** helps keep children safe. But with so many different car safety seats on the market, it's no wonder many parents find this overwhelming.

The type of seat your child needs depends on several things including your child's size and the type of vehicle you have. To be sure your child is using the most appropriate seat, read on.

To see a list of car safety seats and safety seat manufacturers, [click here](#).

### Types of car safety seats at a glance

The chart below is a quick guide on where to start your search; however, it's important to read more about the features and how to use your car safety seat.

Age Group	Type Of Seat	General Guidelines
Infants	Infant seats and rear-facing convertible seats	Infants should ride rear-facing until they reach the highest weight or height allowed by their car safety seat's manufacturer. At a minimum, children should ride rear-facing until they have reached at least 1 year of age <i>and</i> weigh at least 20 pounds. When children reach the highest weight or length allowed by the manufacturer of their infant-only seat, they

should continue to ride rear-facing in a convertible seat.

### **Toddlers/preschoolers**

Convertible seats and forward-facing seats with harnesses

It is best for children to ride rear-facing as long as possible to the highest weight and height allowed by the manufacturer of their convertible seat. When they have outgrown the seat rear-facing, they should use a forward-facing seat with a full harness as long as they fit.

### **School-aged children**

#### **Booster seats**

Booster seats are for older children who have outgrown their forward-facing car safety seats. Children should stay in a booster seat until adult belts fit correctly (usually when a child reaches about 4' 9" in height and is between 8 and 12 years of age).

### **Older children**

Seat belts

Children who have outgrown their booster seats should ride in a lap and shoulder seat belt in the back seat until 13 years of age.

## The right car safety seat

### Infants—rear-facing

The American Academy of Pediatrics (AAP) **recommends** that all infants should ride rear-facing starting with their first ride home from the hospital. They should remain rear-facing until they reach the highest weight or height allowed by their car safety seat's manufacturer. At a minimum, children should ride rear-facing until they have reached at least 1 year of age *and* weigh at least 20 pounds.

There are 2 types of rear-facing car safety seats: infant-only seats and convertible seats.

When children reach the highest weight or length allowed by the manufacturer of their infant-only seat, they should continue to ride rear-facing in a convertible seat.

#### Infant-only seats

- Are small and have carrying handles (and sometimes come as part of a stroller system).
- Are used only for travel (not for positioning outside the vehicle).
- Are used for infants up to 22 to 35 pounds, depending on the model.
- May come with a base that can be left in the car. The seat clicks into and out of the base so you don't have to install the seat each time you use it. Parents can buy more than one base for additional vehicles.

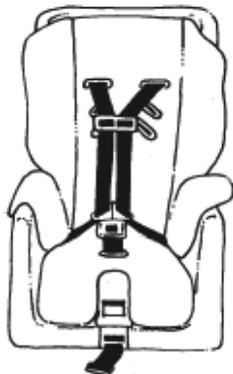


*Photographs courtesy of the National Highway Traffic Safety Administration*  
**Infant-Only Car Safety Seat**

#### Convertible seats (used rear-facing)

- Can be used rear-facing, then "converted" to forward-facing for older children. This means the seat can be used longer by your child. They are bulkier than infant seats, however, and do not come with carrying handles or a separate base.
- Have higher rear-facing weight and height limits than infant-only seats, which make them ideal for bigger babies.
- Have 2 types of harnesses.

**5-point harness**—attach at the shoulders, at the hips, and between the legs



**Overhead shield**—a padded tray-like shield that swings down over the child



**Installation tips for rear-facing seats**

When using a rear-facing seat, keep the following in mind:

- Place the harnesses in your rear-facing seat in slots that are at or below your baby's shoulders
- Ensure that the harness is snug and that the harness clip is positioned at the mid-chest level.
- Make sure the car safety seat is installed tightly in the vehicle.
- *Never* place a rear-facing car safety seat in the front seat of a vehicle that has an active front passenger air bag. If the air bag inflates, it will hit the back of the car safety seat, right where your baby's head is, and could cause serious injury or death.
- Be sure you know what kind of seat belts your vehicle has. Some seat belts need locking clips to keep the belt locked into position. Locking clips come with most new car safety seats. If you're not sure, check the owner's manual that came with your vehicle. Locking clips are not needed in most newer vehicles, and some seats have built-in lock-offs to lock the belt.
- If you are using a convertible seat in the rear-facing position, make sure the seat belt is routed through the correct belt path. Check the instructions that came with the car safety seat to be sure.
- If your vehicle was made after 2002, it may come with the LATCH system, which is used to secure car safety seats. See below for information on using LATCH.
- Make sure the seat is at the correct angle so your infant's head does not flop forward. Many seats have angle indicators or adjusters that can help prevent this. If your seat does not have an angle adjuster, tilt the car safety seat back by putting a rolled towel or other firm padding (such as a pool noodle) under the base near the point where the back and bottom of the vehicle seat meet.
- Be sure the car safety seat is installed tightly. If you can move the seat at the belt path more than an inch side to side or front to back, it's not tight enough.
- Still having trouble? There may be a certified Child Passenger Safety (CPS) Technician in your area who can help. If you need installation help, see below for information on how to locate a CPS Technician.

### Common questions

*Q: What if my baby weighs more than 20 pounds but is not yet 1 year old?*

A: Use a seat that can be used rear-facing to higher weights and keep your baby rear-facing as long as possible into the second year of life.

*Q: What do I do if my baby slouches down or to the side in his car safety seat?*

A: Blanket rolls may be placed on both sides of the infant and a small diaper or blanket between the crotch strap and the infant. Do not place padding under or behind the infant or use any sort of car safety seat insert unless it came with the seat or was made by the manufacturer of the seat.

*Q: Can I adjust the straps when my baby is wearing thicker clothing, like in the winter?*

A: Yes, but make sure the harnesses are still snug. Also remember to tighten the straps again after the thicker clothes are no longer needed. Dress your baby in thinner layers instead of a bulky coat or snowsuit, and tuck a blanket around your baby over the buckled harness straps if needed.

*Q: Are rear-facing convertible seats OK to use for preemies?*

A: **Premature infants** should be tested while still in the hospital to make sure they can ride safely in a reclined position. Babies who need to lie flat during travel should ride in a crash-tested car bed. Very small infants who can ride safely in a reclined position usually fit better in infant-only seats; however, if you need to use a convertible seat, choose one without a tray-shield harness. The shields often are too big and too far from the body to fit correctly and the child's face could hit the shield in a crash.

## Toddlers and preschoolers—forward-facing

Once your child has reached the highest weight or height allowed by the manufacturer of the seat for rear-facing, she can ride forward-facing in a convertible seat. She should ride in a forward-facing seat with a harness until she outgrows it (usually at around 4 years of age and about 40–80 pounds).

There are 5 types of car safety restraints that can be used forward-facing.

- **Convertible seats**—Seats that "convert" from rear-facing to forward-facing seats.

- **Forward-facing only**—These seats can be used forward-facing with a harness for children who weigh up to 40 to 80 pounds (depending on the model).
- **Combination seat with harness**—These seats can be used forward-facing with a harness for children who weigh up to 40 to 80 pounds (depending on the model) or without the harness as a booster (up to 80–100 pounds).
- **Built-in seats**—Some vehicles come with forward-facing seats built in. Weight and height limits vary. Read your vehicle owner’s manual or contact the manufacturer for details about how to use these seats.
- **Travel vests**—These can be worn by children between 20 and 168 pounds and can be an alternative to traditional forward-facing seats. They are useful for when a vehicle has lap-only seat belts in the rear or for children whose weight has exceeded that allowed by car safety seats. These vests may require use of a top tether.



*Photographs courtesy of the National Highway Traffic Safety Administration*  
**Forward-Facing Car Safety Seat**

### **Installation tips for forward-facing seats**

Make sure the car safety seat is installed tightly in the vehicle and that the harness fits the child snugly.

To switch a convertible seat from rear-facing to forward-facing

- Move the shoulder straps to the slots that are at or above your child’s shoulders. On some convertible seats, the top harness slots must be used when facing forward. Check the instructions that came with the seat to be sure.
- You may have to adjust the recline angle of the seat. Check the instructions to be sure.
- Make sure the seat belt runs through the forward-facing belt path. When making these changes, always follow the car safety seat instructions.
- If your vehicle was made after 2002, it should come with the LATCH system, which is used to secure car safety seats. See below for information on using LATCH.

A tether is a strap that attaches to the top of a car safety seat and to an anchor point in your vehicle (see your vehicle owner’s manual to find where the tether anchors are in your vehicle). Tethers give important extra protection by keeping the car safety seat and the child’s head from moving too far forward in a crash or sudden stop. All new cars, minivans, and light trucks have been required to have tether anchors since September 2000. New forward-facing car safety seats come with tethers. For older seats, or if your tether is missing, tether kits are available. Check with the car safety seat manufacturer to find out how you can get a tether if your seat does not have one.

### **Common questions**

*Q: What if I drive more children than can be buckled safely in the back seat?*

A: It’s best to avoid this, especially if your vehicle has air bags in the front seat. All children younger than 13 years should ride in the back seat. If absolutely necessary, a child in a forward-facing car safety seat with a harness may be the best choice to ride in front. Just be sure the vehicle seat is moved as far back away from the dashboard (and the air bag) as possible.

*Q: What do I need to know if my child will be driven by someone else, such as for child care or school?*

A: If your child is being driven by someone else, make sure

- The car safety seat your child will be using fits properly in the vehicle used for transport.
- The car safety seat being used is appropriate for the age and size of your child.
- The person in charge of transporting your child knows how to install and use the car safety seat correctly.

**Child care programs** and schools should have written guidelines for transporting children. These guidelines should include the following:

- All drivers must have a valid driver's license. In some states, school bus drivers need to have a special type of license.
- Staff-to-child ratios for transport should meet or exceed those required for the classroom.
- Every child should be supervised during transport, either by school staff or a parent volunteer, so the driver can focus on driving.
- School staff, teachers, and drivers should know what do to in an emergency, know how to properly use car safety seats and seat belts, and be aware of other safety requirements.

*Q: Should my child ride in a car safety seat on an airplane?*

A: Most infant, convertible, and forward-facing seats can be used on **airplanes**, but booster seats and travel vests cannot. The Federal Aviation Administration (FAA) and the AAP recommend that when flying, children should be securely fastened in certified child restraints until 4 years of age, and then should be secured with the airplane seat belts. This will help keep them safe during takeoff and landing or in case of turbulence. Check the label on your car safety seat or call the car safety seat manufacturer before you travel to see if your seat is certified for use on an airplane. Some car safety seats are approved by the manufacturer for use on airlines for children weighing more than 40 pounds. You can also consider using a restraint made only for use on airplanes and approved by the FAA.

## School-aged children—booster seats

**Booster seats** are for older children who have outgrown their forward-facing car safety seats. It is best for children to ride in a seat with a harness as long as possible, at least to 4 years of age. If your child outgrows his seat before reaching 4 years of age, consider using a seat with a harness approved for higher weights and heights. A child has outgrown his forward-facing seat when any one of the following is true:

- He reaches the top weight or height allowed for his seat with a harness. (These limits are listed on the seat and also included in the instruction booklet.)
- His shoulders are above the top harness slots.
- His ears have reached the top of the seat.

Booster seats are designed to raise the child up so that the lap and shoulder seat belts fit properly. High-back and backless booster seats are available. They do not come with harness straps but are used with the lap and shoulder seat belts in your vehicle, the same way an adult rides. Booster seats should be used until your child can correctly fit in lap and shoulder seat belts. Booster seats typically include a plastic clip or guide to help ensure the correct use of the vehicle lap and shoulder belts. See the instruction booklet that came with the booster seat for directions on how to use the guide or clip.



*Photographs courtesy of the National Highway Traffic Safety Administration*  
**Belt-Positioning Booster Seat**

## Installation tips for booster seats

Booster seats must be used with a lap and shoulder belt. When using a booster seat, make sure

- The lap belt lies low and snug across your child's upper thighs.
- The shoulder belt crosses the middle of your child's chest and shoulder.

## Common questions

*Q: What if my car only has lap belts in the back seat?*

A: Lap belts work fine with infant-only, convertible, and forward-facing seats. If your car only has lap belts, use a forward-facing car safety seat with a harness and higher weight limits. Other options are

- Check to see if shoulder belts can be installed in your vehicle.
- Use a travel vest (some can be used with lap belts).
- Consider buying another car with lap and shoulder belts in the back seat.

*Q: Is there a difference between high-back and backless boosters?*

A: Both types of boosters are designed to raise your child so the seat belts fit properly and both will reduce your child's risk of injury in a crash. High-back boosters are useful in vehicles that do not have head rests or have low seat backs. Many seats that look like high-back boosters are actually combination seats. They come with harnesses that can be used for smaller children and can then be removed for older children. Backless boosters are usually less expensive and are easier to move from vehicle to vehicle. Backless boosters can be safely used in vehicles with headrests and high seat backs.

## Older children—seat belts

Seat belts are made for adults. Your child should stay in a booster seat until adult seat belts fit correctly (usually when the child reaches about 4' 9" in height and is between 8 and 12 years of age). This means

- The shoulder belt lies across the middle of the chest and shoulder, not the neck or throat.
- The lap belt is low and snug across the upper thighs, not the belly.
- Your child is tall enough to sit against the vehicle seat back with her knees bent without slouching and can stay in this position comfortably throughout the trip.

Other points to keep in mind when using seat belts include

- Make sure your child does not tuck the shoulder belt under her arm or behind her back. This leaves the upper body unprotected, putting your child at risk of severe injury in a crash or with sudden braking.
- Never allow anyone to "share" seat belts. All passengers must have their own car safety seats or seat belts.

## Common Questions

*Q: I've seen products that say they can help make the seat belt fit better. Should we get one of these?*

A: No, these products should not be used. In fact, they may actually interfere with proper seat belt fit by causing the lap belt to ride too high on the stomach and making the shoulder belt too loose. They can even damage the seat belt. This rule applies to car safety seats too; do not use any extra products unless they came with the seat. There are no federal safety standards for these products and until there are, the AAP does not recommend they be used. As long as children are riding in the correct restraint for their size, they should not need to use any additional devices.

## Shopping for car safety seats

When shopping for a car safety seat, keep the following tips in mind:

- **No one seat is the "best" or "safest."** The best seat is the one that fits your child's size, is correctly installed, fits well in your vehicle, and is used properly every time you drive.
- **Don't decide by price alone.** A higher price does not mean the seat is safer or easier to use.
- **Avoid used seats if you don't know the seat's history.** Never use a car safety seat that
  - **Is too old.** Look on the label for the date it was made. Check with the manufacturer to find out how long it recommends using the seat.
  - **Has any visible cracks on it.**
  - **Does not have a label with the date of manufacture and model number.** Without these, you cannot check to

see if the seat has been recalled.

- **Does not come with instructions.** You need them to know how to use the seat.
- **Is missing parts.** Used car safety seats often come without important parts. Check with the manufacturer to make sure you can get the right parts.
- **Was recalled.** You can find out by calling the manufacturer or by contacting the National Highway Traffic Safety Administration (NHTSA) Vehicle Safety Hotline at 888/327-4236. You can also visit the NHTSA Web site at [www.odi-nhtsa.dot.gov/cars/problems/recalls/childseat.cfm](http://www.odi-nhtsa.dot.gov/cars/problems/recalls/childseat.cfm).
- **Do not use seats that have been in a moderate or severe crash.** Seats that were in a minor crash may still be safe to use. The NHTSA considers a crash minor if all of the following are true:
  - The vehicle could be driven away from the crash.
  - The vehicle door closest to the car safety seat was not damaged.
  - No one in the vehicle was injured.
  - The air bags did not go off.
  - You can't see any damage to the car safety seat.

If you are unsure, call the manufacturer of the seat. See "Manufacturer phone numbers and Web sites" in **Car Safety Seats: Product Listing** for manufacturer contact information.

## Installing car safety seats correctly

### About front air bags

All new cars come with front air bags. When used with seat belts, air bags work very well to protect teenagers and adults. However, air bags can be very dangerous to children, particularly those riding in rear-facing car safety seats and to preschool and young school-aged children who are not properly restrained. If your vehicle has a front passenger air bag, infants in rear-facing seats *must ride in the back seat*. Even in a relatively low-speed crash, the air bag can inflate, strike the car safety seat, and cause serious brain and neck injury and death.

Vehicles with no back seat or a back seat that is not made for passengers are not the best choice for traveling with small children. However, the air bag can be turned off in some of these vehicles if the front seat is needed for a child passenger. See your vehicle owner's manual for more information.

### About side air bags

Side air bags improve safety for adults in side-impact crashes. Read your vehicle owner's manual for more information about the air bags in your vehicle. Read your car safety seat manual for guidance on placing the seat next to a side air bag.

## LATCH

**LATCH** (Lower Anchors and Tethers for Children) is an attachment system for car safety seats. Lower anchors can be used instead of the seat belt to install the seat and may be easier to use in some cars. The top tether improves the safety provided by the seat and is important to use for all forward-facing seats.

Vehicles with the LATCH system have anchors located in the back seat. Car safety seats that come with LATCH have attachments that fasten to these anchors. Nearly all passenger vehicles and all car safety seats made on or after September 1, 2002, come with LATCH. However, unless both your vehicle *and* the car safety seat have the lower anchor system, you will still need to use seat belts to install the car safety seat.

### If you need installation help

If you have questions or need help installing your car safety seat, find a certified CPS Technician. Lists of certified CPS Technicians and Child Seat Fitting Stations are available on the NHTSA Web site at [www.nhtsa.gov](http://www.nhtsa.gov) or at [www.seatcheck.org](http://www.seatcheck.org). You can also get this information by calling 866/SEATCHECK (866/732-8243) or the NHTSA Vehicle Safety Hotline at 888/327-4236.

## Important reminders

1. **Be a good role model.** Make sure you always wear your seat belt. This will help your child form a lifelong habit of buckling up.
2. **Never leave your child alone in or around cars.** Any of the following can happen when a child is left alone in or around a vehicle:

- He can die of heat stroke because temperatures can reach deadly levels in minutes.
  - He can be strangled by **power windows**, retracting seat belts, sunroofs, or accessories.
  - He can knock the vehicle into gear, setting it in motion.
  - He can be backed over when the vehicle backs up.
  - He can become **trapped in the trunk** of the vehicle.
3. **Always read and follow the manufacturer's instructions.** If you do not have the manufacturer's instructions for your car safety seat, write or call the company's customer service department. They will ask you for the model number, name of seat, and date of manufacture. The manufacturer's address and phone number are on the label on the seat. Also be sure to follow the instructions in your vehicle owner's manual about using car safety seats. Some manufacturers' instructions may be available on their Web sites.

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