

Infant and child passenger restraint systems: the role of pediatric dentistry

James E. Jones, DMD, MS, MSD Karen Bruner Stroup, MA
Carijane Alley, BA Marilyn J. Bull, MD

Protecting children in motor vehicles with safety seats and seat belts has become a national priority. Since the first child restraint legislation enacted by Tennessee in 1978, 49 states have adopted similar requirements.¹ Mandatory child restraint laws are a practical approach to reducing injuries and deaths caused by motor vehicle accidents, the leading cause of death and injury to young children.² The proper use of child restraint systems has been estimated to be 90% effective in preventing deaths and 80% effective in preventing injuries to young children.²

Legislation alone, however, will not produce the desired reductions in deaths and injuries to children. Continuous education from health professionals is essential if the public is to remain aware of the importance of using safety seats and safety belts. In 1983, 1984 children younger than 16 were killed³ and approximately 217,000 children younger than 16 were injured⁴ in automobile accidents on our nation's highways. Studies have found that, even when safety seats are used, 3 of 4 children are not placed in them properly;^{5,6} laboratory tests show that misuse significantly compromises the protection of a child.⁷

Parents must understand the resources available to them, the importance of correct use of restraint devices, and the considerations for selecting a safety seat which meets their needs. Also, parents must be encouraged to practice safety belt use for themselves and older children.

Pediatric dentists can be important resources to patients on the consistent and proper use of car safety seats and safety belts for children. In an informal resource capacity, the pediatric dentist can suggest safe travel in the car as an essential health practice and a preventative measure against craniofacial or dental trauma. To provide useful information to the patient, the pediatric dentist should be aware of the types of restraint devices for infants and toddlers, basic considerations for selecting a safety seat, and resources available for patient education.

Basic Types of Safety Seats

Infant-Only Seats

Infant-only seats are appropriate for a baby from birth to approximately 20 pounds. This seat faces the

rear of the automobile in both front and back seats (Fig 1). An infant should ride facing the rear of the car as long as possible. On frontal impact, the entire head, neck, and back of the baby are pressed into the impact-absorbing shell of the seat. The car seat-back, which the infant faces, should be padded to its full height. For protection in all car safety seats, the child must be secured into the car seat with the internal harness straps and/or shield and the seat must be fastened into the car with the safety belt.

Blanket rolls can be used to pad the sides and crotch strap area of the infant seat. The blankets position the child in the center and prevent his sliding to the side or forward in the seat (Fig 2). Infants should wear clothing which separates their legs so the harness strap can fit between the legs. An infant should be covered with blankets only after being firmly secured in the safety seat with the internal harness straps.

Parents commonly mistake infant carriers or "pumpkin seats" for car seats. To avoid purchasing an unsafe product, parents should be instructed to

check for a label on the safety seat stating that the seat has been dynamically tested. The label on the car seat should indicate a date of manufacture after January 1, 1981, when Federal Motor Vehicle Safety Standard 213 (FMVSS no 213) became effective.⁹ Many safety seats manufactured prior to that date do not meet all the safety requirements set by FMVSS no 213 and cannot be considered safe. Parents should contact manufacturers if there are questions concerning a safety seat's capabilities for protecting a child.

Toddler Seats

Toddler seats face forward in both the back and front seats of the car. Safety belts are attached at the back of the seat, usually through an L-shaped frame or slots in the seat shell. Harness straps retain the child in the seat at 5 points: over both shoulders, across both sides of the pelvis, and between the legs (Fig 3).

Some toddler seats have a soft, padded shield that cushions the child's midsection. A shield is an integral part of the seat's harness system and must be used at all times (Fig 4). Safety seats with large shields should not be used for children who wear eyeglasses. An armrest on a toddler seat is positioned much farther from the child's body than a shield and is not part of the seat's safety system; it is simply an armrest. Owners of small cars should be advised to make certain that the shield or armrest, when released, can spring all the way up to allow the child to enter the seat easily.

A few toddler seats require a tether strap. An anchor plate must be installed directly behind the car seat in a solid metal structural part of the car. If this seat is utilized, detailed instructions for proper installation are provided with the seat.

Many seats, called convertible seats, change from an infant to a toddler seat and the seat frame may be reclined in various positions to accommodate the child. In the rear-facing position for infants, the seat should be adjusted to the most reclined position. In the forward-facing mode for toddlers, the seat back should be in the most upright position. Convertible seats are appropriate for a child from birth to approximately 40 pounds.

Booster Seats

Booster seats are designed for older children from 30 to approximately 60 pounds. A child is too large for a booster seat when the top half of his head extends beyond the height of the car's seat back when he is sitting in a booster seat. Most booster seats require that a chest harness and tether strap be used when a child is riding in the rear seat of a car. In the front seat, a lap-shoulder safety belt system provides proper protection (Fig 5). A second type of booster

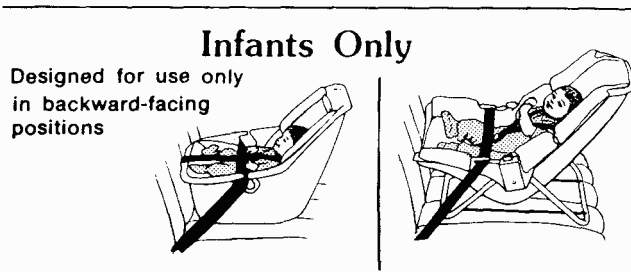


FIG 1. Example of an infant-only safety seat.

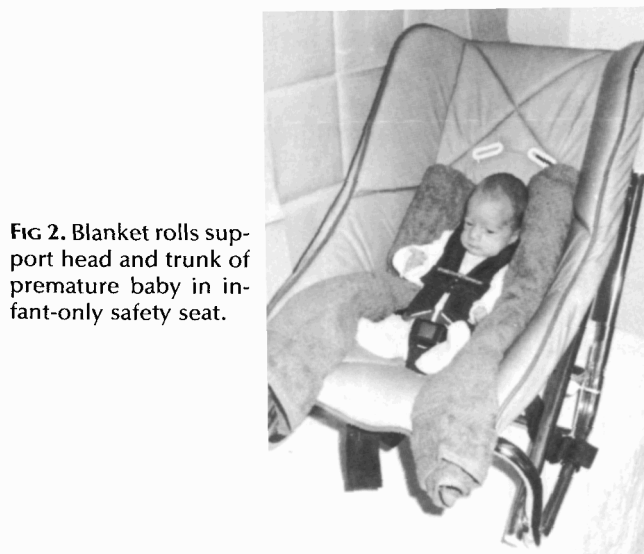


FIG 2. Blanket rolls support head and trunk of premature baby in infant-only safety seat.

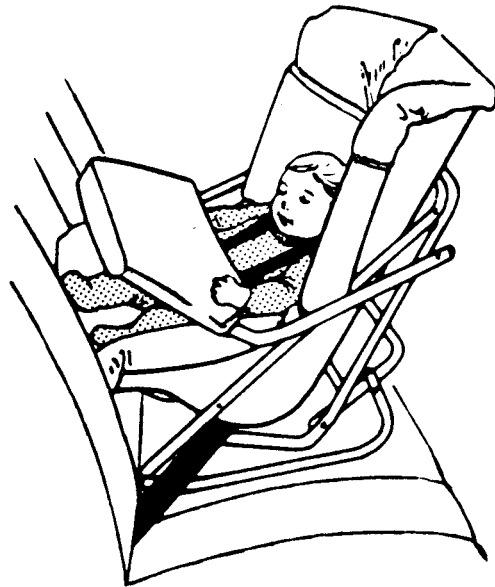
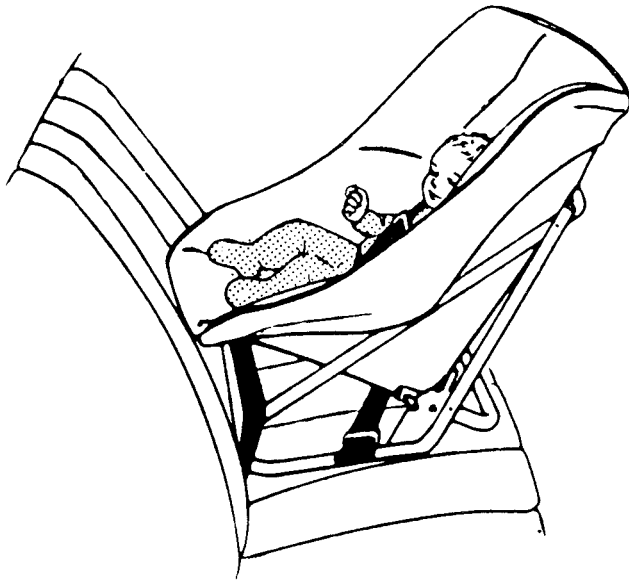


FIG 3. A convertible seat: the upper diagram shows the infant position, while the lower diagram shows the toddler position.

FIG 4. A convertible seat with a shield: the upper diagram shows the infant position, while the lower diagram shows the toddler position.

seat requires that only a safety belt be placed over a shield that covers the child's midsection.

Many parents fail to use the chest harness/tether strap which is required for most booster seats when the child is in the rear seat of the automobile. Laboratory investigations have shown that head injury is most likely to result when a booster seat is used with a lap belt only.⁷ Many parents still associate booster seats with "booster chairs" commonly found in restaurants, and will improvise devices to allow their child to see outside the car. Parents must be cautioned that only those booster seats which have been crash tested provide best protection for the older child.

Selecting a Safety Seat

To determine which safety seat is best for their child, parents should consider which type of seat is appropriate for the age and size of a child and how convenient the seat is to use on an everyday basis. Also, the size of the car and the type of seat belts may affect which safety seat model should be selected.

Prior to purchase, a car seat should be installed in the car with the automobile safety belts and reclined in both the infant and toddler positions to ensure satisfactory fit. The child should be placed in the seat

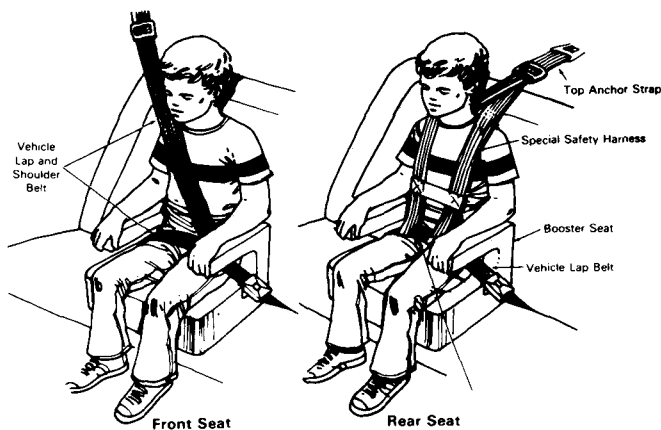


FIG 5. Many booster seats require only the lap-shoulder belt system in the front seat of a car; in the rear seat, a chest harness and tether strap must be used.

to determine if the seat is comfortable and if the internal harness fits the child.

Resources

Dental professionals can provide needed education and information to parents to help increase correct use of safety seats and proper selection of car seats for children. Information concerning the parents' use of restraint systems can be obtained during the first office visit and easily can be included in the child's initial health questionnaire. The parents can be informed of the benefits of such restraint systems and resource material can be provided to them. Several

sources for information and literature appropriate for patient distribution are listed after the references.

Dr. Jones is an associate professor, pedodontics, Indiana University; Ms. Stroup is a research associate, Ms. Alley is an education specialist, and Ms. Bull is an associate professor, pediatrics, and director, Automotive Safety for Children Program, James Whitcomb Riley Hospital for Children, Indianapolis, IN. Reprint requests should be sent to: Dr. James E. Jones, James Whitcomb Riley Hospital for Children, 702 Barnhill Dr., Indianapolis, IN 46223.

1. Sanders RS, Dan BB: Bless the seats and the children: the physician and the legislative process. *J Am Med Assoc* 252:2613-14, 1984.
2. Scherz RG: Restraint systems for the prevention of injury to children in automobile accidents. *Am J Public Health* 66:451-56, 1976.
3. Fatal Accident Reporting System, Washington, DC; National Highway Traffic Safety Administration, Department of Transportation, 1983.
4. National Accident Sampling System, Washington, DC; National Highway Traffic Safety Administration, Department of Transportation, 1983.
5. Stroup KB, Bull MJ, Alley C, Williams JL: Safety seat use in Indiana prior to mandatory legislation. *Indiana Med* 77:866-69, 1984.
6. Shelness A, Jewett J: Observed Misuse of Child Restraints. SAE Child Injury and Restraint Conference Proceedings. Warrendale, PA: Society of Automotive Engineers, Inc, 1983 pp 207-15.
7. Weber K, Melvin JW: Injury Potential with Misused Child Restraining Systems. SAE Child Injury and Restraint Conference Proceedings. Warrendale, Pennsylvania; Society of Automotive Engineers, Inc, 1983 pp 53-59.
8. Bull MJ, Stroup KB, Alley C: Child safety seats: proper use and selection. *Indiana Med* 77:775-79, 1984.
9. Child Restraint Systems. *Federal Register*, 44:72147-59, 1980; 45:29045-48, 67095-96, 82264-65, 1979.

Appendix

1. **National Child Passenger Safety Association**
PO Box 841
Ardmore, PA 19003
(215)642-4360
General Information packages on all areas of child passenger safety.
2. **Physicians for Automotive Safety**
PO Box 430
Armonk, NY 10504
(914)273-6446
Literature and audiovisual materials directed to parents of young patients.
3. **The American Academy of Pediatrics**
141 Northwest Point Rd.
PO Box 927
Elk Grove Village, IL 60007
(312)228-5005
Cross section of information on child passenger safety.
4. **National Safety Council**
1705 DeSales St., NW
Washington, DC 20036
(202)293-2270
Up-to-date legislative information as well as programming ideas on child passenger safety.
5. **National Highway Traffic Safety Administration**
400 Seventh Street, SW
Washington, DC 20036
(202)426-9294
Resource information on all areas of child passenger safety and materials available through each state office of Highway Safety.
6. **National Association of Women Highway Safety Leaders**
7206 Robinhood Dr.
Upper Marlboro, MD 20772
(301)868-7583
Educational materials on child passenger safety and resource information on state associations.
7. **Evenflo (Questor) Juvenile Furniture Company**
1801 Commerce St.
Piqua, OH 45356
(513)773-3971
Audiovisual materials, posters, and pamphlets on child passenger safety.