Update for the Pediatrician on Child Passenger Safety: Five Principles for Safer Travel
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Update for the Pediatrician on Child Passenger Safety: Five Principles for Safer Travel

Marilyn J. Bull, MD*, and Judy Sheese, PhD‡

For many parents, the confusion about how best to restrain their children and the myriad of restraint types that are available can be a major source of frustration. Child safety seat inspectors and advocates whose full-time job is to educate parents, caregivers, and advocates find it challenging to stay current with developments and changes in child occupant protection. For pediatricians who work less frequently and less intensively with child safety seats, the challenge of staying current with information is monumental. However, understanding a few basic principles of child safety seat usage and knowing when and where to refer families for additional information can help pediatricians provide parents and caregivers with the information they need to effectively restrain their children in motor vehicles.

Significant reduction of deaths of children in motor vehicle crashes, especially those involving children <5 years old, has occurred over the past 20 years.1 This has been largely attributable to improvement in child safety seat and vehicle design, intense educational efforts of safety specialists and health professionals, and enforcement of child safety seat laws. Pediatricians have played a prominent role in this process from the early efforts of the First Ride/Safe Ride program of the American Academy of Pediatrics and continue to do so through the formation of policy recommendations and dissemination of public education materials.

National statistics show that 80% to 90% of child safety seats are used incorrectly or misused.2,3 Although many of these misuses are minor, other misuses are considered gross and may render the child safety seat “virtually useless.”4,5 It is common to find child safety seats installed in family vehicles with multiple misuses, and this can collectively degrade performance of the child safety seat. Most parents assume that simply placing their child in a safety seat, placing the seat in their vehicle, and tightening the vehicle belt without using a harness is adequate. Unfortunately, this assumption can be extremely dangerous. Thinking about the details of safety seat use is something few parents actually do.

Aside from the problems associated with proper use of child safety seats, parents may also be confused as to when children can be removed from these safety devices. When children do outgrow child safety seats, many parents assume the natural transition would be to a seat belt, but experience has shown that seat belts do not properly fit children until the child weighs from 60 to 80 pounds.2,6

THE PRINCIPLES

To help parents better protect their children, pediatricians need to understand 5 basic principles of child passenger safety:

1. Air Bags Can Be Dangerous to Children

Passenger air bags have been standard in all new cars since 1996. Although these devices have been credited with saving more than 4750 lives, they have also been implicated in the deaths of 146 people, including 84 children.7 Most child fatalities caused by air bags have occurred when rear-facing safety seats were installed in front of passenger air bags, or when small children were either unrestrained or improperly restrained in front of passenger air bags. According to the Insurance Institute for Highway Safety, air bags reduce deaths for all age groups in frontal crashes by about 14% among right front passengers using their belts and by about 23% among passengers without their belts.8 However, deaths among child passengers <10 years old riding in the front seat are about 34% higher than expected when compared with passengers of all ages.8

Air bag deployment is an explosive event. When an air bag deploys against the back of a rear-facing child safety seat, the impact causes severe or fatal head injuries to the child. The incidence of injury is equally severe when unrestrained or improperly restrained children are seated in front of air bags. In the event of a crash, the child is propelled forward during precrash braking, and when the air bag deploys, the child is propelled back again by the airbag striking the neck and head, causing severe and sometimes fatal injuries.

From the *James Whitcomb Riley Hospital for Children, Department of Pediatrics, and the ‡Automotive Safety for Children Program, Indiana University School of Medicine, Indianapolis, Indiana.

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Reprint requests to (M.J.B.) Department of Pediatrics, James Whitcomb Riley Hospital for Children, 702 Barnhill Dr, Rm 1601, Indianapolis, IN 46202. E-mail: mbull@iupui.edu

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The risk of injury from air bags is not entirely eliminated even when children are properly restrained. Injuries have occurred to young children restrained in front-facing child safety seats by direct impact from a deploying air bag.9 The only way for these injuries to be avoided is for parents to keep their children properly restrained in the back seat of their vehicles. The National Highway Traffic Safety Administration recommends that children <13 years old ride in the back seat at all times, especially when a passenger side air bag is present. In fact, passengers of all ages are better protected when properly restrained in the back seat of a motor vehicle.10 When transporting more than one child, parents need to select the best place for each child, remembering that if someone must ride in the front seat, they should select the child most likely to stay in position at all times. Children frequently move in their seats or lap/shoulder belts and any movement at the wrong time such as leaning forward to adjust the radio could result in air bag injury in even a low-speed crash.

The risk of injury associated with children and side impact air bags, available in some new vehicle models, is also a concern.11 Parents should be advised to place children and child restraints away from all air bags and plan for their transportation needs with this in mind. They should also refer to the vehicle owner’s manual for additional specific information.

2. Infants Must Ride Rear-Facing Until They Are at Least 1 Year Old and Weigh at Least 20 Pounds

Many parents believe inappropriately that children should ride rear-facing until the child can sit upright without assistance, and unfortunately, children as young as 4 or 5 months are put into forward-facing car seats. Additionally, parents are instructed to read their car seat instructions. Older models of car seats were only designed to be rear-facing for children weighing up to 20 pounds and all older car seat instructions have said that children should be rear-facing until they reach 20 pounds with no mention of age. The manufacturer’s instructions also say the seat is not to be used rear-facing when the child weighs >20 pounds. This practice is now obsolete and does not provide the best safety for the infant.

The American Academy of Pediatrics recommends that a child ride rear-facing in a motor vehicle until he or she is at least 1 year old and weighs at least 20 pounds.12 Both milestones should be met before a child is placed in a forward-facing car seat. The rear-facing position provides much better protection for the child’s neck and head. When a child is facing the rear of a vehicle, crash forces are distributed over the entire trunk, the spine is subjected to less extreme forces of flexion, and fewer fractures, dislocations, and deaths occur.13 The protective effects of rear-facing child restraints are well-illustrated in the injury analyses by Volvo in which there were no deaths in rear-facing child restraints in over 20 years of investigation.14

If a child reaches 20 pounds before he or she is 1 year old, parents should be advised to continue placing the child in a rear-facing safety seat that is certi-

3. Adjustments Must Be Made When Convertible Seats Are Changed From Rear- to Forward-Facing

Note: These descriptions are for convertible seats only. Infant-only seats, those that face the rear for children weighing up to 20 pounds, must never be used forward-facing.

Parents should be counseled to read the safety seat manufacturer’s instructions carefully. This is especially important for convertible seats, those that are used rear-facing for infants and forward-facing for toddlers. When child safety seats are changed from rear-facing to forward-facing, some important adjustments in the use of the seat must be made, and those adjustments are detailed in the manufacturer’s instructions.

Rear-facing seats are used in a semi-reclined position. When the seat is turned to face forward, parents need to change it to a more upright position. This allows for better energy distribution in the event of a crash. Changing the recline usually requires that a kickstand be used, but all seats are designed differently in their recline change, and parents, therefore, need to check instructions carefully. When a convertible safety seat is turned forward, the path through which the seat belt is routed will also change. Again, parents can locate the necessary information in their instructions.

Finally, the safety seat’s internal harness system must be changed. The harness system serves a different function when used in the rear-facing versus the forward-facing position. The rear-facing harness position (lower slots) holds the child in the seat while harnesses in the forward-facing position (uppermost slots) hold the child in position and also serve to spread the forces of a crash over the part of the seat that is engineered to withstand them. When the seat is turned to face forward, the shoulder harnesses must be moved so that they are at or above the child’s shoulders and threaded through the highest harness slots that are over a reinforced part of the seat back. This adjustment is very important because straps in the lower slots in most seats are not routed over the reinforced portion of the seat back. The reinforcement in the upper slots, however, will tolerate the force of a crash.

As children grow and the shoulder harness slot is below the child’s shoulders or the child’s ears reach the top of the seat back, the child should be transferred to a belt-positioning booster seat.

4. Safety Seats Must Be Secure in the Vehicle, and the Child Must Be Secure in the Seat

Child safety seats are designed to fit snugly into a vehicle. When properly installed, seats should not move away from the seat back or move side to side.
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seat to accomplish a satisfactory fit.

To properly secure a safety seat, some seat belt systems require additional hardware such as a locking clip or a belt shortening clip. Vehicle owner’s manuals will tell parents if additional hardware is needed and what type is required. Car seats manufactured after September 1, 1999 come with tethers that are designed to be attached to specific points on the vehicle. Tethers help secure the seat and prevent unwanted forward movement of the seat. Again, car

seat and vehicle owner’s instructions must be care-

fully referenced.

All vehicles manufactured after 1997 have seat belt systems that can be locked without additional hardware. For example, many cars manufactured before 1997 have belts that can be converted to locking belts by pulling the seat belt all the way out of the retrac-

tor and then feeding the belt back in. This information is contained in the vehicle owner’s manual.

Aside from being sure the child seat is secure in the vehicle, parents must also be instructed to secure the child properly in the child safety seat. The harness straps should be tightened until there is no more

than 1 finger’s gap between the strap and the clavi-

loose harnesses are one of the most frequent types of misuses noted by car seat inspectors and by researchers. Although parents may worry that such tight harnesses may be uncomfortable for their child, snug harnesses are needed to keep the harnesses over the child’s shoulder and in place. Loose harnesses can be problematic in another way by allowing children to climb out of their safety seats during travel. This can be dangerous for the child and for all occupants of the vehicle as the driver may become distracted. The positioning clip on the harness straps is kept at armpit level and will also help keep the harnesses in place.

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seat to accomplish a satisfactory fit.

5. Children Are Safer in Child Safety Seats as Long as They Fit (About 80 Pounds)

Parents may desire to move children out of child safety seats before the children outgrow the seats. They should be counseled, however, that child safety and belt positioning booster seats appropriate to the size and development of the child will provide better protection than seat belts alone. Most child safety seats will accommodate children up to 40 pounds or higher, and booster seats should be used until the child weighs from 60 to 80 pounds and can properly fit into a seat belt system. Many state laws do not reflect best practice and allow children to ride restrained with seat belts alone before children can actually fit into a seat belt system. However, seat belts do not fit properly until the lap belt fits low and flat across the thighs, the shoulder belt fits across the chest, and the child can sit with his or her bottom against the seat back with his or her knees comfortably bent over the edge of the vehicle seat.

When young children are restrained with lap belts or lap/shoulder seat belts before they fit properly, the lap portion of the belt tends to ride up on the abdomen. In the event of a crash, improper seat belt fit can cause seat belt syndrome, usually in severe crashes, where injuries are caused by the seat belt exerting pressure against the soft tissue of the abdo-

men, resulting in abdominal organ and spinal cord damage. Parents should be reminded that children who are restrained in child safety seats or belt positioning booster seats are able to see out the vehicle window better and may be more content and manageable passengers.

Some parents will move their children into shield booster seats when the children weigh approximately 30 pounds. Unfortunately, these seats do not protect children weighing <40 pounds from possible ejection in the event of a rollover crash and are not approved for use for children weighing >40 pounds because the head excursion of taller children is likely to result in injury in a crash. Parents should be counseled that child safety restraints with internal harness systems provide better protection for their children than do shield booster seats without upper body support. Children should use child safety seats to the

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highest weight allowed for the seat and then use belt positioning booster seats with lap shoulder belts.

Implications

Understanding the parameters of safe transportation of children is complicated for physicians because frequent changes occur in safety seats and in guidelines for restraint use. However, parents can receive invaluable counseling by the emphasis of these 5 principles during routine visits to their pediatrician (Table 1). For specific questions, parents can be referred to certified child safety seat technicians. Certified technicians attend a 4-day training that provides specific and in-depth information on how to properly install child restraint systems. A list of contacts per state is listed on the National Highway Traffic Safety Administration website at www.nhtsa.dot.gov.

Pediatricians also should visit the American Academy of Pediatrics website at www.aap.org to find current and important information about how to help parents properly restrain their children. Policy statements on safe transportation and shopping guides for conventional and special needs child restraints are also available on the website.20–24

It is vital that parents read the manufacturers’ instructions for their child restraint system and for their automobile. Both of these documents have important information about the installation of child safety seats. If these instructions are not followed, parents may install their child safety seat incorrectly and the seat may offer inadequate or ineffective protection in the event of a crash. Pediatricians can reinforce the importance of these instructions during routine counseling.

Ever-changing recommendations, as well as new models of car seats and automobiles adds to the complexity of safe transportation of children. However, efforts are ongoing to simplify child passenger safety for the future emphasizing consistency and effectiveness. Meanwhile, education of parents is critical.

CONCLUSION

By understanding a few basic principles, pediatricians can positively impact major issues affecting the safety of children during travel. Parents may not routinely consider the full implications of safe travel, but pediatricians can raise awareness with parents by asking them to carefully read their child safety seat instructions and vehicle owner’s manual and informing parents of the principles listed above. Those few minutes could save a child’s life.

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REFERENCES

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