

AMERICAN ACADEMY OF PEDIATRICS

Committee on Injury and Poison Prevention

Selecting and Using the Most Appropriate Car Safety Seats for Growing Children: Guidelines for Counseling Parents

ABSTRACT. Despite the existence of laws in all 50 states requiring the use of car safety seats or child restraint devices for young children, more children are still killed as passengers in car crashes than from any other type of injury. Pediatricians and other health care professionals need to provide up-to-date, appropriate information for parents regarding car safety seat choices and proper use. Although the American Academy of Pediatrics is not a testing or standard-setting organization, this policy statement discusses the Academy's current recommendations based on the peer-reviewed literature available at the time of publication and sets forth some of the factors that parents should consider before selecting and using a car safety seat.

ABBREVIATIONS. AAP, American Academy of Pediatrics, NHTSA, National Highway Traffic Safety Administration.

INTRODUCTION

In 2000, 539 children younger than 5 years died while riding in motor vehicles; almost half were unrestrained,¹ and many others were restrained improperly.² Many parents want to know which car safety seat is best for their child. An appropriate car safety seat is the right size for the child, fits the vehicle's seats and seat belt systems, and is easy for parents to use properly. In addition, it must meet all applicable federal safety standards.

Pediatricians also need to be aware that the child occupant protection laws in their states may not reflect the safest way to transport a child. Parents should be counseled to follow the American Academy of Pediatrics (AAP) recommendations for best child passenger restraint, and pediatricians should advocate to improve their state laws to provide better child protection.

AAP RECOMMENDATIONS

Seat Selection

1. Children should face the rear of the vehicle until they are at least 1 year of age **and** weigh at least 20 lb to decrease the risk of cervical spine injury in the event of a crash. Infants who weigh 20 lb before 1 year of age should ride rear facing in a convertible seat or infant seat approved for higher weights until at least 1 year of age.^{3,4} If a car safety seat accommodates children rear facing to higher

weights, for optimal protection, the child should remain rear facing until reaching the maximum weight for the car safety seat, as long as the top of the head is below the top of the seat back.³

2. Premature and small infants should not be placed in car safety seats with shields, abdominal pads, or arm rests that could directly contact an infant's face or neck during an impact and injure the child.⁵
3. For optimal protection, pediatricians should counsel parents of most children (those who weigh more than 12 lb at 4 months of age) to encourage use of a convertible car safety seat that will accommodate them rear facing at higher weights.
4. A convertible car safety seat is positioned semi-reclined and rear facing for a child until at least 1 year of age **and** at least 20 lb. The seat is positioned upright and forward facing for an older and heavier child who weighs up to 40 lb and may be used as long as the child fits well (eg, tops of ears below the top of the car safety seat back and shoulders below the seat strap slots).⁶
5. A forward-facing seat, a combination seat, or a belt-positioning booster seat should be used when the child has outgrown a convertible safety seat but is too small to use the vehicle's safety belts. Vehicle safety belts should not be used until the shoulder belt can be positioned across the chest with the lap belt low and snug across the thighs^{7,8}; the child should fit against the vehicle's seat back with his or her feet hanging down when the legs are bent at the knees. A belt-positioning booster seat should be used until the vehicle safety belt fits well.
6. Many new vehicles are equipped with integrated (built-in) car safety seats that are designed for forward-facing riders who are at least 1 year of age **and** weigh at least 20 lb. All younger infants should be positioned rear facing in separate car safety seats until they are at least 1 year of age **and** weigh at least 20 lb. When purchasing a new vehicle, parents should consider selecting a vehicle with an optional integrated car safety seat. Some integrated seats convert to booster seats for older children.⁹
7. On the basis of Federal Motor Vehicle Safety Standards established by the National Highway Traffic Safety Administration (NHTSA), shield boosters have not been certified by their manufacturers for use by children who weigh more than 40 lb.^{3,10} In current models, the shield can be removed and the restraint can be used with a lap and shoulder

The recommendations in this statement do not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

PEDIATRICS (ISSN 0031 4005). Copyright © 2002 by the American Academy of Pediatrics.

belt as a belt-positioning booster seat for children who are too heavy or tall to fit in a seat with a full harness.

Children who weigh 40 lb or less are best protected in a seat with a full harness.^{3,11} Significant injuries to the head, spine, abdomen, and extremities of children in shield boosters have been documented in crash investigations resulting from ejection, excessive head excursion, and shield contact.¹¹⁻¹⁴ Although boosters with shields may meet current Federal Motor Vehicle Safety Standards for use by children who weigh 30 to 40 lb, on the basis of current published peer-reviewed literature, the AAP does not recommend their use.

8. A number of aftermarket add-on devices claim to solve the problem of poorly fitting seat belts; however, these products may actually interfere with proper lap and shoulder harness fit by positioning the lap belt too high on the abdomen and allowing too much slack in the shoulder harness, placing it too low across the shoulder.¹⁵ Until performance requirements are developed by the NHTSA for aftermarket devices, these products should not be used.
9. Children with special health care needs should have access to appropriate restraint systems.^{16,17} Specific information is available in the AAP policy statement "Transporting Children with Special Health Care Needs"¹⁷ and "Safe Transportation of Children With Special Needs: A Guide for Families."¹⁸

Installation in Vehicle

1. A rear-facing car safety seat must not be placed in the front passenger seat of any vehicle equipped with an air bag on the front passenger side. Death or serious injury to an infant can occur from the impact of the air bag against the back of the car safety seat.^{3,19}
2. Parents should be advised that the rear vehicle seat is the safest place for children of any age to ride. Any front-seat, front-facing passengers should ride properly restrained and positioned as far back as possible from the front air bag on the passenger side.¹⁹
3. Parents should be instructed to read the vehicle owner's manual and child restraint device instructions carefully. When the car safety seat is installed in the car, it should be tested for a safe, snug fit in the vehicle to avoid potentially life-threatening incompatibility problems between the design of the car safety seat, vehicle seat, and seat belt system.
Lower Anchors and Tethers for Children (LATCH) is a new standardized car safety seat attachment system that will simplify car safety seat installation and enhance safety. Most new vehicles and car safety seats will be equipped with this system by September 2002.
4. Infants should ride at approximately a 45° angle to prevent slumping and airway obstruction. If the vehicle seat slopes so that the infant's head flops forward, the car safety seat should be positioned back at an approximately 45° tilt according

to the manufacturer's instructions. Some car safety seats have built-in features that allow adjustment of the angle. For car safety seats that do not adjust, a firm roll of cloth, a solid-core Styrofoam roll, or a tightly-rolled newspaper can be wedged under the car safety seat below the infant's feet to achieve this angle.²⁰

5. Experience with the interaction of vehicle side air bags and car safety seats is limited. To date, no crash studies have established that a child properly restrained in a car safety seat is at risk from current side air bag impact.³ Laboratory simulations have indicated, however, that unrestrained and out-of-position children are at risk of serious injury from a deploying side air bag.²¹ Because children cannot be depended on to remain in position at all times and until additional research and experience is acquired, parents should be counseled about the potential risks and benefits of having side air bags. Parents should consider placing children and car safety seats away from all air bags, choosing a vehicle without side air bags in the rear seat, or deactivating side air bags in rear seats if children are transported in adjacent positions. They may also refer to the vehicle owner's manual for recommendations specific to their vehicle.

Placement of Child in Seat

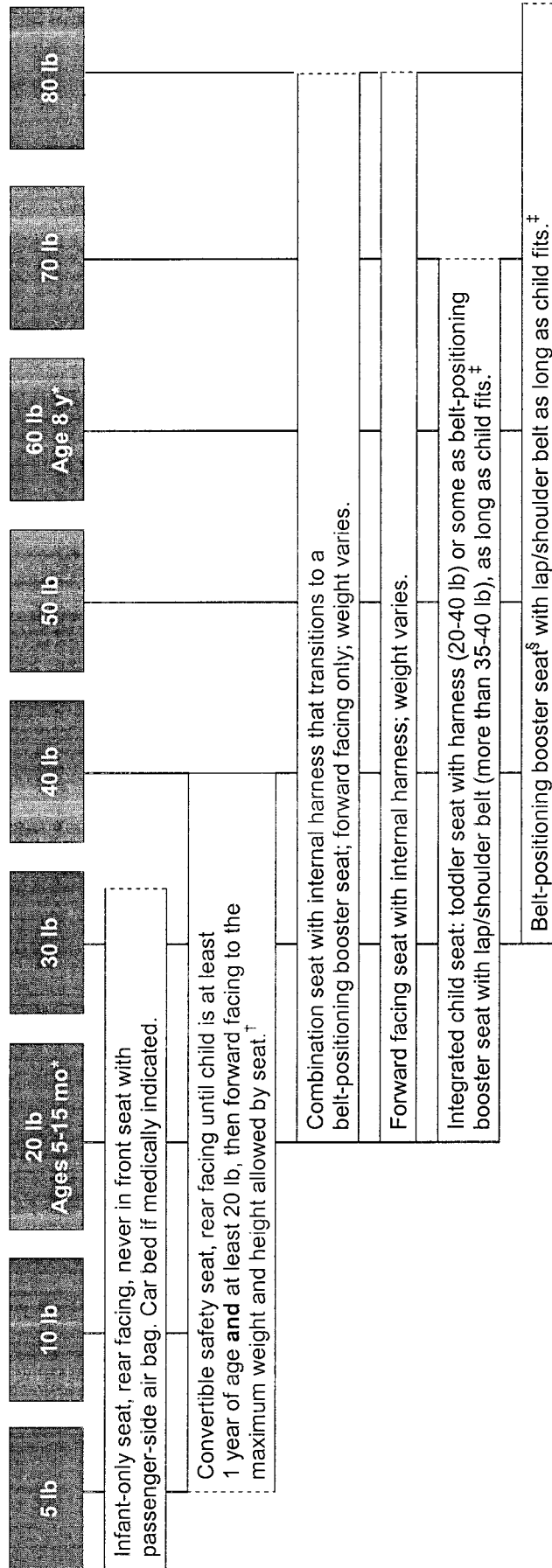
1. In rear-facing car safety seats for infants, shoulder harnesses usually should be placed in the slots at or below the infant's shoulders, the harness should be snug, and the car safety seat's retainer clip should be positioned at the level of the infant's armpit, not on the abdomen or in the neck area (see manufacturers' instructions for details).
2. In forward-facing car safety seats for older children, the shoulder strap should be at or above the child's shoulders, the harness should be snug, and the retainer clip should be positioned level with the child's armpits. This seat should be used until the child reaches the top weight limit of the seat or the tops of his or her ears reach the top of the car safety seat back (see manufacturers' instructions for details).
3. A child should never be left unattended in a car safety seat in or out of the car.

SUMMARY

Existing products provide effective restraint for children riding in motor vehicles and minimize risk of death and injury during car crashes if used appropriately. Parents look to pediatricians for up-to-date, accurate information on selecting and properly using car safety seats. New products that address gaps in restraint protection are continually being developed. Manufacturers should be encouraged to develop car safety seats that accommodate children rear facing to 4 years of age (45 lb). It is important that pediatricians keep abreast of innovations in child passenger safety.²¹ The use of the AAP materials, including "Car Safety Seats: A Guide for Families,"¹⁹ the "One-Minute Car Seat Safety Check-Up,"²³ and "Safe Transportation of Children With Special Needs: A

Fig 1. Car safety seats: selecting the appropriate type.

The safest place in a vehicle for all children is the rear seat. Never place a rear-facing infant seat in the front seat of a vehicle with an activated passenger-side air bag.



Weight limits on specific products vary, and this is indicated by dashed lines at ends of bars. Always read and follow manufacturer's and vehicle instructions. Use of safety belts varies with vehicle belt system and height of child. For additional information on the use of car beds, see the AAP policy statement "Safe Transportation of Premature and Low Birth Weight Infants." For more information, or to locate a local child passenger safety technician, visit www.nhtsa.dot.gov/people/injury/childps

* Usual age range for this weight; individual children's ages will vary widely.

† If car safety seat accommodates children rear facing to higher weights, for optimal protection, the child should remain rear facing to the maximum weight for the seat as long as the head is below the top of the seat back.³

‡ Very tall children may require a combination seat or belt-positioning booster seat before 40 lb.

§ Crash injury data for children in this age group indicate that child safety seats provide more protection than seat belts.⁸

The lap/shoulder belt fits when:

- Shoulder belt fits across mid chest and shoulder
- Lap belt low and snug across thighs
- Child can sit all the way back against vehicle seat and knees bend at edge of vehicle seat

Additional considerations:

Lap/shoulder belt is more protective than a lap only belt. Restrained is safer than unrestrained.

Lap/shoulder belts can be retrofit in some vehicles.

Source: American Academy of Pediatrics, 2002

Guide for Families"¹⁸ can assist the physician in providing specific advice for patients. The information in Fig 1 in this statement will also aid in selecting the appropriate type of restraint. Additional consultation for detailed technical information can be obtained from certified child passenger safety technicians identified by state on the NHTSA Web site (<http://www.nhtsa.dot.gov/people/injury/childps/contacts/index.cfm>). This information will help parents ensure that their children are transported as safely as possible.

COMMITTEE ON INJURY AND POISON PREVENTION,
2001–2002

Marilyn J. Bull, MD, Chairperson
Phyllis Agran, MD, MPH
Victor Garcia, MD
H. Garry Gardner, MD
Danielle Laraque, MD
Susan H. Pollack, MD
Gary A. Smith, MD, DrPH
Milton Tenenbein, MD
Joseph Wright, MD, MPH

LIAISONS

Ruth A. Brenner, MD, MPH
National Institute of Child Health and Human
Development
Stephanie Bryn, MPH
Health Resources and Service
Administration/Maternal and Child Health Bureau
Richard A. Schieber, MD, MPH
Centers for Disease Control and Prevention
Alexander Sinclair
National Highway Traffic Safety Administration
Deborah Tinsworth
US Consumer Product Safety Commission
Lynn Warda, MD
Canadian Paediatric Society

CONSULTANT

Murray L. Katcher, MD, PhD

STAFF

Heather Newland

REFERENCES

1. National Highway Traffic Safety Administration, National Center for Statistics and Analysis. *Traffic Safety Facts 2000: A Compilation of Motor Vehicle Crash Data From the Fatality Analysis Reporting System and the General Estimates System*. Washington, DC: US Department of Transportation; 2000. DOT HS Publ. No. 809 337. Available at: <http://www.nhtsa.dot.gov/people/ncsa/>. Accessed January 22, 2002
2. Decina LE, Kneobel KY. Child safety seat misuse patterns in four states. *Accid Anal Prev*. 1997;29:125–132
3. Weber K. Child passenger protection. In: Nahum AM, Melvin JW, eds. *Accidental Injury: Biomechanics and Prevention*. New York, NY: Springer-Verlag; 2002:523–549
4. Weber K. Rear-facing restraint for small child passengers: a medical alert. *UMTRI Res Rev*. 1995;25:12–17
5. Bull MJ, Weber K, Stroup KB. Automotive restraint systems for premature infants. *J Pediatr*. 1988;112:385–388
6. Johnston C, Rivara FP, Soderberg R. Children in car crashes: analysis of data for injury and use of restraints. *Pediatrics*. 1994;93:960–965
7. Agran PF, Dunkle DE, Winn DG. Injuries to a sample of seatbelted children evaluated and treated in a hospital emergency room. *J Trauma*. 1987;27:58–64
8. Winston FK, Durbin DR, Kallan MJ, Moll EK. The danger of premature graduation to seat belts for young children. *Pediatrics*. 2000;105:1179–1183
9. American Academy of Pediatrics. *Car Safety Seats: A Guide for Families*. Elk Grove Village, IL: American Academy of Pediatrics; (updated annually)
10. Federal Motor Vehicle Safety Standards and Regulations. 49 CFR §571.213 (1998)
11. Marriner PC, Woolford JG, Baines GA, Dance DM. Abdominal shield booster cushions in motor vehicle accidents. In: *Proceedings of the Canadian Multidisciplinary Road Safety Conference IX*. Montreal, Quebec, Canada: University of Montreal; 1995:233–240
12. Whitman GR, Brown KA, Cantor A, D'Aulerio LA, Eisentraut DK, Markushewski ML. Booster-with-shield restraint case studies. SAE 973307. *Child Occupant Protection 2nd Symposium*. Warrendale, PA: Society of Automotive Engineers; 1997:149–157
13. Stalnaker RL. Spinal cord injuries to children in real world accidents. SAE 933100. *Child Occupant Protection 2nd Symposium*. Warrendale, PA: Society of Automotive Engineers; 1997:173–183
14. Slavik DH. Cervical distraction injuries to children. SAE 973306. *Child Occupant Protection 2nd Symposium*. Warrendale, PA: Society of Automotive Engineers; 1997:137–148
15. Blue Ribbon Panel II. Protecting Our Older Child Passengers. *Recommendations*. March 15, 1999. Available at: <http://carseat.org/whatsnew/blueribbon.htm>. Accessed April 9, 2001
16. American Academy of Pediatrics, Committee on Injury and Poison Prevention. Safe transportation of newborns at hospital discharge. *Pediatrics*. 1999;104:986–987
17. American Academy of Pediatrics, Committee on Injury and Poison Prevention. Transporting children with special health care needs. *Pediatrics*. 1999;104:988–992
18. American Academy of Pediatrics. *Safe Transportation of Children With Special Needs: A Guide for Families*. Elk Grove Village, IL: American Academy of Pediatrics; In press
19. Centers for Disease Control and Prevention. Warnings on interaction between air bags and rear-facing child restraints. *MMWR Morb Mortal Wkly Rep*. 1993;42:280–282
20. American Academy of Pediatrics, Committee on Injury and Poison Prevention and Committee on Fetus and Newborn. Safe transportation of premature and low birth weight infants. *Pediatrics*. 1996;97:758–760
21. Duma SM, Crandell JR, Pilkey WD, Seki K. Dynamic response of the Hybrid III 3-year-old dummy head and neck during side air bag loading. In: *Proceedings of the Association for the Advancement of Automotive Medicine 42nd Conference*. Barrington, IL: Association for the Advancement of Automotive Medicine; 1998:193–208
22. Bull MJ, Sheese J. Update for the pediatrician on child passenger safety: five principles for safer travel. *Pediatrics*. 2000;106:1113–1116
23. American Academy of Pediatrics. *One-Minute Car Seat Safety Check-Up*. Elk Grove Village, IL: American Academy of Pediatrics; 2001

Selecting and Using the Most Appropriate Car Safety Seats for Growing Children: Guidelines for Counseling Parents

Committee on Injury and Poison Prevention

Pediatrics 2002;109;550

DOI: 10.1542/peds.109.3.550

Updated Information & Services

including high resolution figures, can be found at:
<http://pediatrics.aappublications.org/content/109/3/550>

References

This article cites 11 articles, 6 of which you can access for free at:
<http://pediatrics.aappublications.org/content/109/3/550#BIBL>

Subspecialty Collections

This article, along with others on similar topics, appears in the following collection(s):
Injury, Violence & Poison Prevention
http://www.aappublications.org/cgi/collection/injury_violence_-_poison_prevention_sub
Carseat Safety
http://www.aappublications.org/cgi/collection/carseat_safety_sub

Permissions & Licensing

Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:
<http://www.aappublications.org/site/misc/Permissions.xhtml>

Reprints

Information about ordering reprints can be found online:
<http://www.aappublications.org/site/misc/reprints.xhtml>

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Selecting and Using the Most Appropriate Car Safety Seats for Growing Children: Guidelines for Counseling Parents

Committee on Injury and Poison Prevention

Pediatrics 2002;109;550

DOI: 10.1542/peds.109.3.550

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/109/3/550>

Pediatrics is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. Pediatrics is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2002 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 1073-0397.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

