



Child safety seats: 2010 educational update

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Parental education about the use of age-appropriate child restraints is an essential aspect of all routine well-child examinations. Despite this guidance, automobile accidents remain the leading cause of death in children 8 years of age and younger. The evolution of the car seat began in the 19th century and its design continues to change to incorporate further safety advancements. Each of the 50 states has laws regarding child restraints; however, most do not correspond with those set forth by the American Academy of Pediatrics and the Insurance Institute for Highway Safety. As a child advances from a rear-facing car seat to a booster seat, it is crucial to know the height, weight, and age milestones necessary to make such changes. Parents or guardians need to understand that every car seat has a manufacturing date and that most expire within 5 years of that date. Lack of physical strength by caretakers may contribute to improper installation of child restraints. Many valuable resources exist for both physicians and parents/guardians regarding child restraint safety, reliability, and recalls. Family physicians play a pivotal role in educating parents about up-to-date car restraint recommendations during routine health maintenance examinations for pediatric patients.

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During routine well-child examinations, family physicians regularly provide preventive medicine education to patients and their parents or guardians. Physicians encourage the routine use of seat belts and age-appropriate car or booster seats for children and adolescents. Unfortunately, automobile accidents remain the leading cause of death among children under the age of 8 years.¹ In one study of 204,028 restrained children involved in an automobile accident, only 59% were optimally confined in both size- and age-appropriate restraints.² Comprehending current recommendations on age-appropriate car safety restraints and properly educating caregivers is essential for primary care physicians to enhance preventive care medicine.

Evolution of the car seat and safety data

The development of car seats originated early in the 19th century. The initial intention was to prevent a child from falling off the seat while the vehicle was in motion rather than protecting the child from potential injury.³⁻⁵ An English inventor, James Ames, developed a padded seat that attached to the rear side of the passenger seat and restrained the child in a Y-shaped harness that fit over the head and shoulders with a connection between the legs.⁵ This device is similar to the five-point harness of today's car seats but lacks current safety measures. During the 1960s, car seats transitioned from a fall prevention device to a child safety device. Because most injuries are the result of acceleration of the body during deceleration of the automobile, Swedish auto designers developed the first rear-facing child safety seat focusing on coupling the deceleration of the body with that of the car.⁴ Further safety advancements in the design of car seats continued to evolve over the following years.

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Table 1 Car Seat Guidelines by Age

Child's age	Car seat type	Recommendations
Infant	Infant carrier seat or rear-facing convertible car seat	Rear-facing until 1 year <i>and</i> 20 lb
Toddlers	Convertible or forward-facing car seat with a 5-point harness or belt-positioning booster (BPB) seat with a 5-point harness	Remain rear-facing until child reaches the seat's weight limit or until top of the child's head is above the top of the seat back
School-aged children	BPB seat	Use 3-point seat belt (lap and shoulder) until the child reaches 8 years <i>or</i> 57 inches
Older children (>8 yr)	Seat belt	Children should remain in the rear seat until 13 years

From 1975 to 2005, The National Highway Traffic Safety Administration projected that almost 7900 young lives were saved during this 30-year period simply by using car seats.⁶ Despite these advancements, approximately five children were killed (1264 in 2007) and 548 were injured in automobile accidents each day during the year 2007.⁷ Although this represents a 65% decline in child passenger deaths since 1975, there remains much room for improvement.⁸

National guidelines

Although some form of law for child restraint use exists in all 50 states, specific requirements are vastly different and many do not conform to the guidelines set forth by both the American Academy of Pediatrics (AAP) and the Insurance Institute for Highway Safety (IIHS).^{1,9-11} The ideal car seat for a child is one that is the right size for that child, is compatible with the current vehicle's seat belt system, is not difficult for caregivers to use, and meets all of the safety standards set forth by the federal government.⁹

Installing a child restraint system (CRS) in the center rear seating location is the optimal position recommended by current guidelines because it is furthest from crash impact and confers a 43% lower risk of injury compared with a rear outboard seating position.^{2,9,12-14} All car seats should be securely fastened to the seat of an automobile via either the seat belt of the car or to the Lower Anchors and Tethers for Children (LATCH) system, limiting motion of the car seat to less than 1 inch from front to back or side to side.^{2,9,11-13,15-17} Most CRSs also contain an angle indicator to guide caregivers in achieving the appropriate installation angle.¹⁸ Infants should always ride rear-facing in either an infant carrier seat, which is often sold as part of a travel system or in a convertible car seat, until the child is both one year of age and weighs 20 pounds.^{1,2,9-12,14-17} Rear-facing car seats not only support the infant's head and prevent airway obstruction, but distribute the force of the crash along the infant's back, which is the strongest part of the body at that age.^{9,11,14,15,17-19} Because of the risk of death or

serious injury, a rear-facing car seat should never be installed in the front passenger seat of any automobile equipped with a passenger-side front air bag.^{9,12,15,16,18} When an infant carrier-type car seat is used, it is important to instruct caregivers to fasten the straps tightly with the chest clip over the infant's sternum and to position the carrying handle of the car seat in the appropriate driving position according to the manufacturer's instructions. A common misuse of this type of seat involves leaving the handle in the carrying position.¹⁷ This may result in further harm to the baby in the event of a crash by inflicting an acceleration injury when the handle impacts the roof of the vehicle, disrupting the intended motion of the car seat during a collision. For the best possible protection, a child should remain rear-facing beyond one year of age until they reach the maximum weight for a particular car safety seat provided the top of the child's head is below the top level of the seat back.^{1,6,9,12,15,16,20}

Once a child has outgrown a forward-facing car seat, it is recommended that the child remain restrained in a belt-positioning booster seat (BPB) with three-point seat belt until the child reaches the 8-year milestone or a height greater than 57 inches.^{1,2, 6,9,15,16,21-23} Unfortunately, caregivers of booster seat-age children may be unaware that seat belts do not provide the most ideal protection for a child.²⁴ BPBs are shallower than the seats of a vehicle, which permits a child's knee to naturally bend at the edge of the booster, prompting the child to sit up straight and allowing the seat belt to fit much like it does on an adult.^{2,7,21,22,30} Improper placement of an adult seat belt on young children may result in critical spinal cord or abdominal injury, which is known as "seatbelt syndrome."^{2,22,24} Children between the ages of 8 and 12 years, and those younger than 8 who have outgrown a booster seat, should travel in the rear seat with a lap and shoulder adult seat belt.^{1,2,6,9,15,16,21-23} Please refer to Table 1 for a summarization chart of the above information to use during the preventive care visit.

Premature infants are a group of special interest because of the possible medical complications resulting from travel

in a traditional infant car seat. These complications include increased risk of oxygen desaturation, bradycardia, or apnea associated with the semireclined position of car safety seats.^{9,19} Some preterm infants may need to travel in a crash-tested car bed, which allows the infant to ride in a fully reclined position perpendicular to the direction of travel.^{9,15,18,19} All preterm infants should undergo a period of observation of at least 90 minutes before hospital discharge in the car seat or bed. Caregivers of preterm infants should be encouraged to minimize infant travel time to essential short trips and medical appointments.^{18,19}

In addition to using age- and size-appropriate child safety restraints, caregivers must ensure that the child is fastened tightly in the seat, leaving no extra slack in the straps with the chest clip positioned over the child's sternum. When using a BPB seat, the shoulder strap of the car's seat belt should fit firmly across the child's sternum and rest at the level of the shoulder, and the lap portion of the belt should fit snugly across the child's iliac crests. Bulky outerwear should be minimized to prevent interfering with the proper positioning of the seat belt straps on the child's body.

State laws

No state law requiring children to be restrained passengers in a moving vehicle existed before 1978.^{3,4,6} Tennessee was the pioneer state in this area behind the efforts of Dr. Robert Sanders, also known as "Dr. Seat Belt," who finally convinced legislation to pass a bill in 1977.⁶ Similar laws subsequently came into existence in all 50 states including the District of Columbia.

Every state has different laws regarding car seat use; however, the general consensus is that all children under the age of 3 must travel in child restraints while riding in an automobile. Many states have increased this age limit to 7 years old, with the maximum first-time offense ranging from \$25 to \$150.¹⁰ Caregivers depend on state laws for guidelines on proper child restraint practices.^{6,21} Therefore, corresponding laws with the currently recommended best practices by the AAP and IIHS may alleviate caregiver confusion concerning the most effective way to protect children.

Please refer to [Table 2](#) for specific information on the car seat laws in your state, which has been adapted with permission from the IIHS, last revised November 2009.

Primary physician involvement

Primary care physicians play an essential role in educating patients and caregivers about age-appropriate car seat use during the anticipatory guidance portion of yearly physical examinations. In fact, physicians are highly regarded as credible sources for child safety information by most parents or guardians.¹² In the July 2004 Child Passenger Safety

Report, parents of booster-age children seemed to rely on recommendations obtained at earlier physician visits when the child was an infant or young toddler.² It is crucial for physicians to review age-appropriate CRSs with all patients.

Parents or guardians of children aged 3 to 8 years who did not use booster seats reported a misunderstanding that the child was big enough for an adult belt or shoulder seat belt as the primary rationale for booster seat non-use.^{1,2,21,23,24} It is extremely important for physicians to understand the role of booster seats and counsel caregivers of children aged 3 to 8 on appropriate use. A significant number of caregivers may inquire about which car seat/booster seat is best for a child.^{2,9,11,21,23,24} There are numerous available resources for physicians to refer parents and caregivers, which are listed in [Table 3](#). Caregivers will not only find information about specific child restraint seats recommended by other parents, but also information on appropriate installation, and the location of free inspection stations, where a trained professional will inspect the car seat and ensure appropriate installation.

In addition to educating caregivers on age-appropriate child restraints, physicians also need to educate them about other features of child restraints. Every car seat has a manufacturing and expiration date printed on the car seat. Patients receiving "hand-me-down" car or booster seats may not realize that the car seat has an expiration date.

For patients using hand-me-down car seats, it is imperative for the car seat to meet the following requirements:

- Contains a label identifying its model number and manufacture date
- Is less than 6 years old
- Has never been recalled
- Does not have any missing parts or visible cracks
- Has never been involved in a moderate or severe motor vehicle accident¹⁷

Unfortunately, recalls on car seats are administered on a frequent basis and caregivers are inadequately informed of these changes.^{9,15} For caregivers to be aware of recall updates, the CRS must be registered with the manufacturer by either returning the registration card from the box or by completing the registration form on the website of the car seat manufacturer. Registered car seats owners should immediately be notified by the manufacturer of any new recalls. Information on recalls is also available by contacting the National Highways Traffic Safety Administration at 1-888-327-4236 or by visiting their website at <http://www.safercar.gov>. The above patient information is included in a patient handout found in [Table 4](#).

Osteopathic considerations

Improperly installed CRSs may not be solely caused by lack of understanding of appropriate installation but rather because of biomechanical limitations of the human body. A

Table 2 IIHS Child Restraint Laws—November 2009

Who is covered?				
State	Must be in child restraint	Adult safety belt permissible	Maximum fine first offense	Law states preference for rear seat
Alabama	Younger than 1 year or <20 lb in a rear-facing infant seat; 1–4 years or 20–40 lb in a forward-facing child safety seat; 5 but not yet 6 years in a booster seat	6–14 years	\$25*	Law states no preference for rear seat
Alaska	Younger than 1 year or <20 lb in a rear-facing infant seat; 1–4 years and >20 lb in a child restraint, 4–15 years who are either shorter than 57 inches or weigh >20 but <65 lb in a booster	4–7 years who are at least 57 inches or >65 lb; 7–15 years who are <57 inches or weigh <65 lb	\$50*	Law states no preference for rear seat
Arizona	4 years and younger	Not permissible	\$50	Law states no preference for rear seat
Arkansas	5 years and younger and <60 lb	6–14 years or ≥60 lb	\$100	Law states no preference for rear seat
California	5 years and younger or <60 lb [†]	6–15 years or ≥60 lb	\$100*	Children 5 years and younger or <60 lb must be in the rear seat [†]
Colorado	Younger than 1 year and <20 lb in a rear-facing infant seat; 1–3 years and 20–40 lb in a forward-facing child safety seat; 4–5 years and <55 inches in a booster seat [‡]	6–15 years or ≥55 inches	\$81	Law states no preference for rear seat
Connecticut	Younger than 1 year or <20 lb in a rear-facing restraint system; 1–6 years and <60 lb in a child restraint system (booster seats may only be used in a seating position with a lap and shoulder belt)	7–15 years and ≥60 lb [§]	\$60 [§]	Law states no preference for rear seat
Delaware	7 years and younger and <66 lb [¶]	8–15 years or ≥66 lb [§]	\$25	Children 11 years and younger and ≤65 inches must be in rear seat if passenger airbag is active [¶]
District of Columbia	7 years and younger	8–15 years	\$75*	Law states no preference for rear seat
Florida	3 years and younger	4–5 years	\$60*	Law states no preference for rear seat
Georgia	5 years and younger and ≤57 inches	>57 inches	\$50*	5 years and younger must be in rear seat if available
Hawaii	3 years and younger in a child safety seat; 4–7 years must be in a booster seat or child restraint	4–7 years who are taller than 49 inches; 4–7 years who are ≥40 lb seated in a rear seat, where if there are no available lap/shoulder belts, may be restrained by a lap belt	\$100#	Law states no preference for rear seat

Table 2 (continued)

Who is covered?				
State	Must be in child restraint	Adult safety belt permissible	Maximum fine first offense	Law states preference for rear seat
Idaho	6 years and younger	Not permissible	\$100	Law states no preference for rear seat
Illinois	7 years and younger	8–15 years; children who weigh >40 lb seated in the rear where only a lap belt is available	\$50	Law states no preference for rear seat
Indiana	7 years and younger**	8–15 years	\$25*	Law states no preference for rear seat
Iowa	Younger than 1 year and <20 lb in a rear-facing child seat; 1–5 years	6–10 years	\$25	Law states no preference for rear seat
Kansas	All children 3 years and younger must be in a child restraint; children 4–7 years who weigh <80 lb and children 4–7 who are <57 inches must be in a child restraint or booster seat	All children 8–13 years; children 4–7 years who weigh >80 lb, and children 4–7 years who are >57 inches	\$60	Law states no preference for rear seat
Kentucky	≤40 inches in a child restraint; 6 years and younger who are between 40 and 50 inches tall in a booster seat	6 years and younger who are >50 inches	\$50 child restraint; \$30 booster seat	Law states no preference for rear seat
Louisiana	Younger than 1 year or <20 lb in a child safety seat; 1–3 years or 20–39 lb in a forward-facing child safety seat; 4–5 years or 40–60 lb in a child booster seat	6–12 years or >60 lb	\$100	Law states no preference for rear seat
Maine	<40 lb in a child safety seat; 40–80 lb and younger than 8 years in a safety system that elevates the child so that an adult seat belt fits properly	8–17 years or younger than 18 years and more than 59 inches	\$50	11 years and younger and <100 lb must be in rear seat if available
Maryland	7 years and younger and either <57 inches or ≤65 lb	8–15 years; children who are at least ≥57 inches or ≥65 lb	\$25	Law states no preference for rear seat
Massachusetts	7 years and younger and <57 inches	8–12 years; children who are ≥57 inches	\$25	Law states no preference for rear seat
Michigan	7 years and younger and <57 inches	8–15 years; children who are ≥57 inches	\$10	3 years and younger must be in the rear seat if available
Minnesota	7 years and younger and <57 inches	Not permissible	\$50	Law states no preference for rear seat
Mississippi	3 years and younger must be in a child restraint; 4–6 years and either <57 inches or <65 lb must be in a booster seat	6 years and younger who either weigh ≥65 lb or who are ≥57 inches	\$25	Law states no preference for rear seat

Table 2 (continued)

Who is covered?				
State	Must be in child restraint	Adult safety belt permissible	Maximum fine first offense	Law states preference for rear seat
Missouri	3 years and younger must be in a child restraint; all children who weigh <40 lb must be in a child restraint; 4–7 years who weigh \geq 40 lb but <80 lb and who are \leq 59 inches must be in either a child restraint or booster seat; children 4 years and older who weigh \geq 80 lb or who are \geq 59 inches must be in either a booster seat or safety belt	All children 8–16 years; all children 4 years and older who weigh \geq 80 lb or who are >59 inches	\$50; \$10 for violations involving children >59 inches or who weigh \geq 80 lb	Law states no preference for rear seat
Montana	5 years and younger and <60 lb	Not permissible	\$100	Law states no preference for rear seat
Nebraska	5 years and younger	6–17 years††	\$25*	Law states no preference for rear seat
Nevada	5 years and younger and \leq 60 lb	Not permissible	\$500††	Law states no preference for rear seat
New Hampshire	5 years and younger who are <55 inches	6–17 years; younger than 6 who are \geq 55 inches	\$50	Law states no preference for rear seat
New Jersey	7 years and younger and <80 lb	Not permissible	\$25	Children 7 years and younger and <80 lb must be in the rear seat if available
New Mexico	Younger than 1 year in a rear-facing infant seat; 1–4 years or <40 lb in a child safety seat; 5–6 years or <60 lb in a booster seat	7–17 years	\$25	Children younger than 1 year in a rear-facing infant seat must be in the rear seat if available
New York	3 years and younger unless they weigh >40 lb and are seated where there is no available lap/shoulder belt; 4–7 years unless they are seated where there is no available lap/shoulder belt (effective 11/24/09)	8–15 years; children who weigh >40 lb or children 4–6 years in a seating position where there is no available lap/shoulder belt (effective 11/24/09)	\$100*	Law states no preference for rear seat
North Carolina	7 years and younger and <80 lb	8–15 years and children 40–80 lb in seats without shoulder belts	\$25*	Children 4 years and younger who weigh <40 lb must be in the rear seat unless the front passenger airbag is deactivated or the restraint is designed for use with airbags
North Dakota	6 years and younger and <57 inches or <80 lb	7–17 years; 6 years and younger and \geq 57 inches and \geq 80 lb; 6 years and younger and \geq 40 lb, if there are no available lap/shoulder belts, may be restrained by a lap belt	\$25*	Law states no preference for rear seat

Table 2 (continued)

Who is covered?				
State	Must be in child restraint	Adult safety belt permissible	Maximum fine first offense	Law states preference for rear seat
Ohio	3 years and younger or <40 lb in child restraint; 4–7 years who weigh \geq 40 lb and are <57 inches in booster seat	8–14 years§§	\$75§§	Law states no preference for rear seat
Oklahoma	5 years and younger¶¶¶	6–12 years	\$25	Law states no preference for rear seat
Oregon	Younger than 1 year or \leq 20 lb must be in a rear-facing child safety seat; \leq 40 lb must be in a child safety seat; >40 lb but \leq 59 inches must be in a safety system that elevates the child so that an adult seat belt fits properly	>59 inches	\$90	Law states no preference for rear seat
Pennsylvania	7 years and younger¶¶¶	Not permissible	\$100	Law states no preference for rear seat
Rhode Island	7 years and younger and <57 inches and <80 lb	7 years and younger who either weigh \geq 80 lb or who are \geq 57 inches; 8–17	\$75	Children 7 and younger must be in rear seat if available
South Carolina	Younger than 1 year or <20 lb in a rear-facing infant seat; 1–5 years and 20–39 lb in a forward-facing child safety seat; 1–5 years and 40–80 lb in a booster seat secured by lap-shoulder belt (lap belt alone is not permissible)	1–5 years and \geq 80 lb or any child 5 years and younger if the child's knees bend over the seat edge when sitting up straight with his/her back firmly against the seat back	\$150	Children 5 years and younger must be in rear seat if available
South Dakota	4 years and younger and <40 lb	5–17 years; all children \geq 40 lb, regardless of age	\$20	Law states no preference for rear seat
Tennessee	Younger than 1 year or \leq 20 lb in a rear-facing infant seat; 1–3 years and \geq 20 lb in a forward-facing infant seat; 4–8 years and <59 inches in a booster seat	9–15 years or any child 12 or younger who is \geq 59 inches	\$50	Children 8 years and younger and <59 inches must be in rear seat if available; rear seat recommended for children 9–12 years
Texas	7 years and younger and <57 inches	Not permissible	\$25	Law states no preference for rear seat
Utah	7 years and younger and <57 inches	8–15 years; all children \geq 57 inches	\$45	Law states no preference for rear seat
Vermont	Younger than 1 year or <20 lb in a rear-facing infant seat; 2–7 years and >20 lb	8–15 years and >20 lb	\$25	Children 1 year and younger or <20 lb must be in the rear seat unless the front passenger airbag is deactivated
Virginia	7 years and younger unless they have a physician exemption##	8–15 years##	\$50	Children in rear-facing devices must be in a rear seat if available; if not available, they may be placed in front only if front passenger airbag is deactivated##

Table 2 (continued)

Who is covered?

State	Must be in child restraint	Adult safety belt permissible	Maximum fine first offense	Law states preference for rear seat
Washington	7 years and younger and <59 inches	8–15 years; 7 years and younger and ≥ 59 inches; children who weigh >40 lb in a seating position where there is only a lap belt available	\$124	12 years and younger must be in rear seat if practical
West Virginia	7 years and younger and <59 inches	7 years and younger and ≥ 59	\$20	Law states no preference for rear seat
Wisconsin	Children younger than 1 year and all children who weigh <20 lb are required to be in a rear-facing infant seat; children 1–3 years who weigh ≥ 20 lb but <40 lb are required to be in a forward-facing child safety seat; children 4–7 years who both weigh ≥ 40 lb but <80 lb and who are <57 inches are required to be in a booster seat	8 years and younger and >80 lb and ≥ 57 inches	\$75	Children 3 and younger must be in a rear seat, if available
Wyoming	8 years and younger	Not permissible	\$50	Children 8 years and younger must be in the rear seat if available

*This state assesses points for violations.

[†]In California, children weighing more than 40 pounds may be belted without a booster seat if they are seated in the rear seat of a vehicle not equipped with lap/shoulder belts. The California rear seat requirement does not apply if: there is no rear seat, the rear seats are side-facing jump seats, the rear seats are rear-facing seats, the child passenger restraint system cannot be installed properly in the rear seat, all rear seats are already occupied by children under 12 years, or medical reasons necessitate that the child not ride in the rear seat. A child may not ride in the front seat of a motor vehicle with an active passenger airbag if the child is younger than 1 year or weighs less than 20 pounds, or is riding in a rear-facing child restraint system.

[‡]In Colorado, if a child 4 to 5 years and less than 55 inches is being transported in a vehicle equipped with a lap belt only, then the child must be restrained with the lap belt. The law is secondary for children ages 4 to 5 years who must be in booster seats.

[§]The fine in Connecticut is \$15 if the child is 4 to 16 years and 40 pounds or more. Connecticut also requires a mandatory child restraint education program for first or second violation.

[¶]In Delaware, children younger than 12 years or 65 inches or less must be restrained in a rear seat if a vehicle has a passenger airbag, unless the airbag has been either deactivated or designed to accommodate smaller people. Exceptions: no rear seat or rear seat occupied by other children younger than 12 years or 65 inches or less.

^{||}In Georgia, children weighing more than 40 pounds are permitted to be restrained in the back seat of a vehicle by a lap belt if the vehicle is not equipped with lap and shoulder belts or when the lap and shoulder belts are being used by other children who weigh more than 40 pounds.

[#]Hawaii drivers are charged \$50 for a mandatory child restraint education program and a \$10 surcharge deposited into a neurotrauma special fund.

^{**}In Indiana, children weighing more than 40 pounds are permitted to be restrained by a lap belt if the vehicle is not equipped with lap and shoulder belts or if all lap and shoulder belts other than those in the front seat are being used to restrain other children who are younger than 16 years.

^{††}Nebraska's law is secondary for children who may be in safety belts and standard for those who must be in a child restraint device.

^{‡‡}In Nevada, the minimum fine is \$100. An alternative to the fine is at least 10 but not more than 50 hours of community service.

^{§§}In Ohio, the law is secondary for children 4 through 14 years.

^{¶¶}In Oklahoma, children weighing more than 40 pounds are permitted to be restrained in the back seat of a vehicle by a lap belt if the vehicle is not equipped with lap and shoulder belts or when the lap and shoulder belts are being used by other children who weigh more than 40 pounds.

^{|||}In Pennsylvania, the law is secondary for children ages 4 through 7 years who must be in booster seats.

^{##}In Virginia, children at least 4 years but less than 8 years may be belted if any licensed physician determines that use of a child restraint system by a particular child would be impractical by reason of the child's weight, physical fitness, or other medical reason, provided that any person transporting a child so exempted shall carry on his person or in the vehicle a signed written statement of the physician identifying the child so exempted and stating the grounds for the determination.

Table 3 Patient and physician resources

Buying a Safer Car for Children: <http://www.safercar.gov>
Car Seat Guides for Families: <http://www.aap.org/family/carseatguide.htm>
Car Seat Installation: <http://www.chop.edu/carseat>
Child Restraint Recalls: <http://www-odi.nhtsa.dot.gov/cars/problems/recalls/childseat.cfm>
Ease of Use Rating: <http://www.nhtsa.gov/Safety/Ease-of-Use>
Inspection Stations:
<http://www.seatcheck.org>
<http://www.safekidsweb.org/events/events.asp>
<http://www.nhtsa.gov>
Top Rated Car Seats: <http://www.consumerreports.org>
Vehicle Safety Ratings and State Laws: <http://www.highwaysafety.org>
Booster Seat Teaching Tools: <http://www.aap.org/family/cpsissuereport-family.pdf>
Car Seat Positioning Seat Teaching Tools: <http://www.aap.org/family/CarSeatSittingPosition.pdf>
Selecting and Using the Most Appropriate Car Safety Seats for Growing Children: Guidelines for Counseling Parents:
<http://aappolicy.aappublications.org/cgi/content/full/pediatrics;109/3/550>

Table 4 Patient Handout

Current Car Seat Recommendations

Child's age	Car seat type	Recommendations
Infant	Infant carrier seat or rear-facing convertible car seat	Rear-facing until 1 year <i>and</i> 20 lb
Toddlers	Convertible or forward-facing car seat with a 5-point harness or belt positioning booster (BPB) seat with a 5-point harness	Remain rear-facing until child reaches the seat's weight limit or until top of the child's head is above the top of the seat back
School-aged children	BPB seat	Use 3-point seat belt (lap and shoulder) until the child reaches 8 years old <i>or</i> 57 inches
Older children (>8 yr)	Seat belt	Children should remain in the rear seat until 13 years old

Used Car Seat Checklist

All used car seats should meet the following requirements before use:

- Contains a label identifying its model number and manufacture date
- Is less than 6 years old
- Has never been recalled
- Does not have any missing parts or visible cracks
- Has never been involved in a moderate or severe motor vehicle accident*

Online Resources

Buying a Safer Car for Children: <http://www.safercar.gov>
Car Seat Guides for Families: <http://www.aap.org/family/carseatguide.htm>
Car Seat Installation: <http://www.chop.edu/carseat>
Child Restraint Recalls: <http://www-odi.nhtsa.dot.gov/cars/problems/recalls/childseat.cfm>
Ease of Use Rating: <http://www.nhtsa.dot.gov/CPS/CSSRating/Index.cfm>
Inspection Stations:
<http://www.seatcheck.org>
<http://www.safekidsweb.org/events/events.asp>
<http://www.nhtsa.gov>
Top Rated Car Seats: www.consumerreports.org
Vehicle Safety Ratings and State Laws: <http://www.highwaysafety.org>
Booster Seat Teaching Tools: <http://www.aap.org/family/cpsissuereport-family.pdf>
Car Seat Positioning Seat Teaching Tools: <http://www.aap.org/family/CarSeatSittingPosition.pdf>
Selecting and Using the Most Appropriate Car Safety Seats for Growing Children: Guidelines for Counseling Parents:
<http://aappolicy.aappublications.org/cgi/content/full/pediatrics;109/3/550>

*Mayo Clinic Staff. *Car Seat Safety: Avoid 10 Common Mistakes.* Available at: <http://www.mayoclinic.com/health/car-seat-safety/MY00824>

study by Brown et al demonstrated that maximum efforts and awkward postures are required to adequately install a CRS into a vehicle.¹³ Some caregivers may not be physically able to optimally attach the CRS with the car's seat belts or provide enough force to tighten the seat belt enough to limit the motion of the car seat to less than one inch in all directions. Another important consideration is the somatic dysfunction that a caregiver may develop while attempting to install a CRS. The bending and twisting motion necessary to install the seat may cause severe muscle spasms and pain in the back and neck, which can lead to significant vertebral disc injury.^{25,26} In addition, caregivers who choose to use an infant carrier seat during a child's first year of life physically transport heavier and more cumbersome cargo. The act of bending and lifting these car seats is awkward and causes an increased risk of injury to the lower back region.²⁷ Hauling the carrier to each destination and repeatedly inserting and removing it from the base attached to the vehicle's seat may also result in osteopathic dysfunction. Ideally, an extra minute should be spent with caregivers instructing them on proper lifting and musculoskeletal mechanics in an effort to limit the development of somatic dysfunction.^{26,28}

Conclusions

Motor vehicle crashes remain the leading cause today of injury and death among children under the age of 12. Properly restraining children in the appropriate child restraints on every trip is the most valuable decision any caregiver can make for a child. Family physicians play a vital role in educating parents and guardians with the most current information on age-appropriate car seat restraints during routine health maintenance examinations for pediatric patients.

References

1. Winston, Flaura, et al: Recent trends in child restraint practices in the United States. *Pediatrics* 113:458-464, 2004
2. American Academy of Pediatrics: Partners for Child Passenger Safety: CPS Issue Report: Booster Seats. July 2004. Available at: <http://www.aap.org/healthtopics/carseatsafety.cfm>. Accessed August 4, 2009.
3. ArticlesBase: The History of the Car Seat. Available at: <http://www.articlesbase.com/education-articles/the-history-of-the-car-seat-593547.html>. Accessed August 7, 2009.
4. The History of Car Seats—The Ride that Saves Lives. Available at: <http://www.thehistoryof.net/history-of-car-seats.html>. Accessed September 28, 2009.
5. Holmes GS: Child Safety Seat. Available at: <http://www.madehow.com/Volume-5/Child-Safety-Seat.html>. Accessed September 27, 2009.
6. Savage M, Teigen A: Most precious cargo: child restraints continue to save young lives, but gaps persist in many state laws. *State Legislatures* 34:32-33, 2008
7. National Highway Traffic Safety Administration (NHTSA): Traffic Safety Facts. 2007 Data. Available at: <http://www.nrd.nhtsa.dot.gov/pubs/811017.pdf>. Accessed August 23, 2009.
8. Insurance Institute for Highway Safety: Fatality Facts 2007. Available at: http://www.iihs.org/research/fatality_facts_2007/children.html. Accessed August, 2009.
9. American Academy of Pediatrics: Car Safety Seats: A Guide for Families 2010. Available at: <http://www.aap.org/family/carseatguide.htm>. Accessed July 29, 2009.
10. Insurance Institute for Highway Safety: Child Restraint Laws October 2009. Available at: <http://www.iihs.org/laws/ChildRestraint.aspx>. Accessed November 10, 2009.
11. American Academy of Pediatrics: Home pages. Available at: <http://www.aap.org>. Accessed August 12, 2009.
12. Partners for Child Passenger Safety: CPS Issue Report: Safe Seating for Children. May 2005. Available at: <http://www.aap.org/healthtopics/carseatsafety.cfm>. Accessed August 4, 2009.
13. Brown SH, et al: Strength limitations to proper child safety installation: implications for child safety. *Appl Ergon* 40:617-621, 2009
14. Kallan MJ, et al. Seating patterns and corresponding risk of injury among 0- to 3-year-old children in child safety seats. *Pediatrics* 121: 1342-1347, 2008
15. Safe Kids USA: Child Passenger Safety. Available at: <http://www.usa.safekids.org>. Accessed August 5, 2009.
16. American Academy of Pediatrics: Selecting and using the most appropriate car safety seats for growing children: guidelines for counseling parents. *Pediatrics* 109:550-553, 2002
17. Mayo Clinic Staff: Car Seat Safety: Avoid 10 Common Mistakes. Available at: <http://www.mayoclinic.com/health/car-seat-safety/MY00824>. Accessed September 18, 2009.
18. Bull MJ, et al: Safe transportation of preterm and low birth weight infants at hospital discharge. *Pediatrics* 123:1424-1429, 2009
19. Committee on Injury and Poison Prevention and Committee on Fetus and Newborn: Safe transportation of premature infants. *Pediatrics* 87:120-122, 1991
20. Damashek A, Peterson L: Unintentional injury prevention efforts for young children: levels, methods, types, and targets. *Dev Behav Pediatr* 23:443-455, 2002
21. Durbin DR, Elliott M, et al: Belt-positioning booster seats and reduction in risk of injury among children in vehicle crashes. *JAMA* 289: 2835-2840, 2003
22. Winston FK, Durbin DR, et al: The danger of premature graduation to seat belts for young children. *Pediatrics* 105:1179-1183, 2000
23. O'Neil J, Daniels DM, et al: Seat belt misuse among children transported in belt-positioning booster seats. *Accid Anal Prev* 41:425-429, 2009
24. Ebel BE, Koepsell TD, et al: Too small for a seatbelt: predictors of booster seat use by child passengers. *Pediatrics* 111:323-327, 2003
25. Van Der Burg, et al: Lifting an unexpectedly heavy object: the effects of low back loading and balance loss. *Clin Biomech* 15:469-477, 2000
26. Natarajan RN, et al: Biomechanical response of a lumbar intervertebral disc to manual lifting activities. *Spine* 33:1958-1965, 2008
27. Pope MH, et al: Spine ergonomics. *Annu Rev Biomed Eng* 4:49-69, 2002
28. Fort CW: Getting to the root of your patient's back pain. *Nursing* 7:36-41, 2009