



Car Seat Safety

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Unintentional injuries are the leading cause of death for children aged 1 to 18 years in the United States. Motor vehicle collisions (MVCs) contribute significantly to this category; of children 12 years or younger who died in an MVC, 38% were not appropriately secured in their vehicle. Car seats dramatically reduce the risk of injury in the event of an MVC and reduce the risk of death by 28%. Clinicians have a valuable role in ensuring that caregivers understand the importance of car seat safety for preventing injury, as demonstrated by evidence of the benefits of clinician counseling.

The American Academy of Pediatrics (AAP) first recommended universal car seat use during infant travel in the 1970s. Since then, technological advances in car seat manufacturing and increased evidence have supported the lifesaving capacity of car safety restraints through childhood and adolescence. The current AAP policy statement recommends that any child younger than 13 years ride in the back seat with an appropriate restraint to optimize their protection. Many types of car safety restraints are available (Table 1). The 4 main categories of car safety restraints are 1) rear-facing car seats, 2) forward-facing car seats, 3) booster seats, and 4) seat (lap) belts, with differences based on weight, height, age, and developmental readiness of the child. A car bed is sometimes recommended if an infant's clinical condition is such that they must remain in a fully reclined position during travel. Car bed use varies widely across US newborn nurseries.

For young children, rear-facing car seats have been demonstrated to be the most effective at protecting against serious injury in the event of an MVC. In 2018, the AAP updated its policy statement to recommend that children ride rear-facing for as long as possible until they have outgrown the weight and height limit recommended by the car seat manufacturer. There is variation in weight and height limits depending on the manufacturer and the type of safety restraint (eg, infant car seat, convertible car seat, etc). Because this is a change from the previous recommendation to ride rear-facing until age 2 years, clinicians may want to emphasize this concept during counseling. Children will require a car seat or a booster seat until the vehicle's seat belt fits securely across the child's lap: the shoulder belt should lie across the chest and not at the neck, and the lap belt should be low across the legs and not at the abdomen. Most children can properly use a lap belt by age 13 years provided they measure at least 4 feet 9 inches in height.

To maximize their effectiveness, the proper installation and use of car safety seats are paramount, yet for many caregivers, installing car seats and booster seats can be stressful and challenging. Although most caregivers report using a car seat, only 57% to 74% actually do so correctly while using an age-appropriate restraint. Therefore, many caregivers may benefit from referral to a child

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Table 1. Overview of Car Safety Restraints and Recommendations for Use

RESTRAINT	RECOMMENDED AGE RANGE	NOTES
Rear-facing car seat	Birth until ≥ 2 y	Because rear-facing is the safest orientation, children should remain in a rear-facing car seat as long as possible until they outgrow the weight or height limit as set forth by the manufacturer (typically 30–40 lb [13.6–18.1 kg]). Available as infant car seats (rear-facing only) or convertible car seats (rear-facing or forward-facing configurations). Most convertible car seats have higher weight and height limits, allowing the child to remain rear-facing for a longer time.
Forward-facing car seat	After exceeding weight or height limit for rear-facing seat until 5–7 y	After outgrowing the rear-facing seat, children should use the forward-facing seat as long as possible until the weight or height limit is exceeded (typically 65–90 lb [29.5–40.8 kg]).
Booster seat	After exceeding weight or height limit for forward-facing car seat until ≥ 8 –12 y	Booster seats are used from the time children outgrow a forward-facing car seat until they no longer require the booster seat to properly position the seat belt across their lap and shoulder. May come in a high-back or backless form.
Seat belt	When the child reaches the size where the seat belt fits properly, typically at a height of 4 foot 9 inches or greater	A properly fitted seat belt should sit across the upper thighs (lap belt) and center of the shoulder and chest. The shoulder belt should not overlay the child's neck or face.
Car bed	Used at physician's discretion typically for newborn or neonatal ICU discharge based on clinical concerns about safe travel in a semi-upright rear-facing car seat; car bed use varies widely among US nurseries	Most rear-facing car seats accommodate infants with a minimum weight of 4–5 lb (1.8–2.3 kg). A car bed has weight requirements specified by the manufacturer and are designed to accommodate infants in a fully reclined position.

passenger safety technician (CPST) to ensure correct car seat selection, installation, and use. Car seat safety check programs yield many opportunities to improve child safety; approximately half of the children whose seats were examined by a CPST required a change in use. Several online resources are available for helping families find a CPST, including <https://cert.safekids.org/>. These specially trained individuals are certified by the National Highway Traffic Safety Administration to provide education and hands-on assistance to caregivers in the proper installation, fit, and safe use of car seats. In addition, clinicians may want to emphasize the availability of CPSTs for children of all ages because the literature demonstrates that CPSTs are seldom used for children at booster seat age.

Beyond ensuring proper installation and fit, caregivers should be counseled on limiting use outside of travel, ensuring that car seats are not placed on elevated or unstable surfaces, and monitoring infants during car seat use. In particular, clinicians should advise against using infant car seats for routine sleep outside of the vehicle because reviews of car seat deaths suggest that caregivers' false perception of the car seat as a safe sleeping environment is a contributing factor. Updated AAP guidelines underscore the importance of avoiding car seat use for routine

sleep and reducing injury risk by avoiding leaving infants unattended or with straps unbuckled in car seats.

Caregivers face many practical challenges to optimal car seat use in specific situations. National survey data demonstrate that caregivers less frequently report appropriate restraint use in situations such as carpooling and rental car use. A growing number of caregivers and children use ride sharing services; state standards for the application of car seat safety laws to these services vary, so caregivers may benefit from counseling on using appropriate restraints when using these services. Consistency with respect to use of car safety restraints during every ride and role modeling by the caregiver can lay a foundation of positive habits during car travel. Caregivers may have questions about whether and when to replace car seats. Although evidence is lacking to support specific timing for replacement, the National Highway Traffic Safety Administration recommends replacing car seats after a moderate or severe crash.

Discharge from the newborn hospitalization is a critical period for establishing appropriate car seat safety. Prenatal pediatric visits should reinforce that the first ride home should be a safe ride using child restraint systems. In addition, some infants may experience cardiorespiratory instability (ie, desaturations, apnea, or bradycardia) when

placed in the semi-upright position such as that of a rear-facing car seat. Therefore, the AAP recommends that all preterm (<37 weeks' gestation) and low-birthweight newborns undergo a 90-minute or longer observation (known as the "car seat tolerance screen") in the child's car seat before discharge from the birth hospitalization. Children with other conditions placing them at risk for obstructive apnea, bradycardia, or desaturations (eg, Trisomy 21, micrognathia, congenital heart disease, or neuromuscular disorders) may also be considered for screening. Most US newborn nurseries and NICUs have implemented car seat tolerance screening; however, there is no evidence-based consensus on the appropriate management of infants who fail a car seat tolerance screen. At the physician's discretion, repeated testing, additional medical evaluation, prolonged hospitalization, or, less commonly, car beds (Table 1) may be used.

In summary, car safety restraint systems, including car seats, booster seats, and seat belts, are highly effective when used properly. The safest orientation for infants and toddlers remains a rear-facing car seat, and the child's height and weight must be considered when transitioning to forward-facing car seats and booster seats. The progression from a booster seat to a seat belt among school-age children typically occurs between ages 8 and 12 years and depends on the proper alignment of the seat belt on the child's lap and shoulder. Referrals to CPSTs can assist caregivers with questions about proper installation of a car safety seat. Finally, misuse of car seats, particularly when not being used for travel, is a significant preventable cause of infant injury and death. The pediatrician's role in car seat safety is to provide appropriate counseling at all stages of infancy and childhood to encourage optimal adherence to this guidance by caregivers.

Comments: As pediatricians, we should be proud of our pediatric colleagues who have advocated for child car safety to incorporate appropriate state laws. The breadth of that

advocacy extends to the research performed and to our roles in educating families and ourselves on evidence-based strategies. The first child restraint law was put into effect in 1978 in Tennessee, and by 1985 all 50 states and Washington, DC, had some type of child restraint laws, although ongoing research has modified and updated these laws to be in line with best practices. Racial inequities exist, and we must continue to work to minimize these inequities that may be due to lack of knowledge, lack of culturally sensitive intervention programs, and the financial issues involved with having safe and age-appropriate child restraint systems. Implementation of correct child car safety seat use is complex. There are specific recommendations and needs for different types of car seat devices based on the weight and height of the infant/child and other individual factors, such as prematurity, neuromuscular disorders, or after injuries such as limb fractures, which require modifications of car safety use. Correct installation of the infant devices is challenging, often requiring an expert to assist. In addition, remembering that the child safety restraints need to be used for every ride to be effective, whether in a parent's/caregiver's own vehicle, in rental cars, ride sharing, or carpooling with other children. Hence, the control is not always in the hands of parents but within an entire community. As in so many areas of medical care, role modeling is important, so reaching parents is paramount. Not surprisingly, parents who use seat belts are more likely to use child car safety restraints for their own children and parents who use booster seats for their children are more likely to use them for the children for whom they carpool. It truly takes a village to ensure the safety of our future generations.

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ANSWER KEY FOR JUNE PEDIATRICS IN REVIEW

Dental Caries: Early Intervention and the Role of the Pediatrician: 1. B; 2. A; 3. E; 4. D; 5. D.

Care of the Adolescent with Congenital Heart Disease: Beyond the Lesion: 1. C; 2. D; 3. B; 4. D; 5. A.

Acute Weakness: Three Patient Cases: 1. A; 2. E; 3. E; 4. D; 5. A.