

Editorial

Car safety in children

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All parents wish that their children are safe and healthy as they grow and learn with age. Today, children face numerous threats, but motor vehicle accidents, especially in the absence of car safety seats, are among the chief killers. For instance, motor vehicle injuries are the leading cause of death among children in the United States of America¹ and placing children in age- and size-appropriate car seats and booster seats have reduced serious and fatal injuries by more than half².

Seat selection

Children should face the rear of the vehicle until they are at least 1 year of age *and* weigh at least 10 kg to decrease the risk of cervical spine injury in the event of a crash. Infants who weigh 10 kg 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 age³. 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 back³. 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 child⁴. For optimal protection, paediatricians should counsel parents of most children (those who weigh more than 5.5 kg at 4 months of age) to encourage use of a convertible car safety seat that will accommodate them rear facing at higher weights.

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 10 kg. The seat is positioned upright and forward facing for an older and heavier child who weighs up to 20 kg and may be used as long as the child fits well (e.g. tops of ears below the top of the car safety seat back and shoulders below the seat strap slots)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^{6,7}. 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. 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 10 kg. 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 10 kg. 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 children⁸. Children who weigh 20 kg or less are best protected in a seat with a full harness^{3,9}. 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 contact¹⁰. Children with special health care needs should have access to appropriate restraint systems¹¹.

Installation in vehicle

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^{3,12}. 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 side³.

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)¹³ is a new standardized car safety seat attachment

system that simplifies car safety seat installation and enhances safety.

Infants should ride at approximately a 45 degree 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 degree 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 are not adjustable, a firm roll of cloth or a tightly-rolled newspaper can be wedged under the car safety seat below the infant's feet to achieve this angle¹⁴.

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 impact³. Laboratory simulations have indicated, however, that unrestrained and out-of-position children are at risk of serious injury from a deploying side air bag¹⁵. 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

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. 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. A child should never be left unattended in a car safety seat in or out of the car.

In crashes, small children who wear adult seatbelts can suffer characteristic "seat-belt syndrome" injuries including severed intestines, ruptured diaphragms

and spinal damage. There is also research suggesting that children in inappropriate restraints are at significantly increased risk of head injury¹⁶.

Restraint use among young children often depends upon the driver's seat belt use. Almost 40% of children riding with unbelted drivers were themselves unrestrained¹⁷.

Child restraint systems are often used incorrectly. One study found that 72% of nearly 3,500 observed car and booster seats were misused in a way that could be expected to increase a child's risk of injury during a crash¹⁸.

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