Prevention of Unintentional Childhood Injuries

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Injuries are the leading cause of death in children and teenagers in the United States. The leading causes of unintentional injury vary by age and include drowning, poisoning, suffocation, fires, burns, falls, and motor vehicle, bicycle, and pedestrian-related crashes. Most injuries are preventable by modifying the child's environment (e.g., use of stair gates) and having parents engage in safety practices (e.g., keeping matches or lighters out of reach of children). Effective injury prevention methods include the use of childproof caps on medications and household poisons, age-appropriate restraints in motor vehicles (i.e., car seats, booster seats, seat belts), bicycle helmets, and a four-sided fence with a locked gate around residential swimming pools. (Am Fam Physician 2006;74:1864-9, 1870. Copyright © 2006 American Academy of Family Physicians.)

ILLUSTRATION BY MARK E. SCHULER

▶ **See related editorial on page 1839.**

AGF This article exemplifies the AAFP 2006 Annual Clinical Focus on caring for children and adolescents.

▶ **Patient information:** A handout on childhood injuries, written by the author of this article, is provided on page 1870.

Childhood injuries are responsible for approximately 16,000 deaths each year in the United States, and more than 70 percent of these deaths are the result of unintentional injuries.[1] Nonfatal unintentional injuries also are a significant cause of childhood morbidity. More than 20 million nonfatal injuries are estimated to occur in U.S. children each year, costing $347 billion and accounting for more than 300,000 hospital admissions.[2,3]

A shift in semantics from "accident prevention" to "injury prevention and control" was initiated in the 1970s to focus attention on preventable health outcomes.[4] Injury prevention strategies generally are classified into three types: education, engineering and environmental modification, and legislative interventions.[5] Active interventions are those that require action on the part of an individual person to confer protection (e.g., buckling a seatbelt), whereas passive interventions provide automatic protection regardless of individual behavior (e.g., automobile airbags).

Parent-focused and environmental strategies are effective in preventing injuries, particularly those occurring in young children at home.[6] However, most parents cannot identify specific prevention strategies and believe that simply "being careful" is adequate protection from injury.[7] Although little research has addressed the direct effect of counseling parents on the reduction of injury rates, there is evidence that clinical counseling can influence car seat use, at least in the short term,[8,9] and can positively influence the rates of owning a functioning smoke alarm.[9-11] The U.S. Preventive Services Task Force found fair evidence to support counseling parents of young children on measures to reduce injury risk.[12] Anticipatory guidance topics should be considered an important component of medical care for children and families.

Age Groups at High Risk of Injury

The leading causes of fatal unintentional injuries in children and teenagers younger than 18 years are motor vehicle crashes, drowning, fires and burns, and suffocation.[1] The leading causes of nonfatal injuries resulting in hospitalization are falls, poisoning, scald burns, and motor vehicle, bicycle, and pedestrian-related crashes.[13,14] Evidence-based recommendations for the prevention of fatal and nonfatal injuries are summarized in *Table 1*.[10-12,15-21]

SORT: KEY RECOMMENDATIONS FOR PRACTICE

Clinical recommendation	*Evidence rating*	*References*
To prevent sudden infant death syndrome, newborns should be placed on their backs to sleep.	B	21
To prevent injury in motor vehicle crashes, all children should be placed in age-appropriate child restraint seats.	A	12
To prevent drownings, swimming pools should be surrounded completely by fencing that is difficult to climb and that does not allow direct access from the house. Gates should have self-closing latches.	A	16

A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, see page 1821 or http://www.aafp.org/afpsort.xml.

INFANTS

Suffocation. Most injury-related deaths in infants (66 percent) are the result of suffocation.[1] Today, most suffocation deaths occur because infants are placed in sleeping environments that do not meet guidelines for infant safety. A 17-year review of infant suffocation deaths found that the leading causes of suffocation are wedging (between the mattress and wall or bed frame), oronasal obstruction by bedding or a soft sleeping surface, overlaying by another person, head entrapment in a space through which the body had passed, and hanging (e.g., by caught clothing).[22] A descriptive study of infants who died suddenly and unexpectedly found that most infants were found in unsafe sleeping positions (e.g., prone position, head or face covered by soft bedding) or in environments not specifically designed for infants (e.g., adult beds, couches, cushioned chairs, co-sleeping with one or more persons).[23] Both studies concluded that safe sleeping practices may prevent many infant deaths *(Table 1*[10-12,15-21]*).*[22,23] The American Academy of Pediatrics (AAP) recently stressed the importance of safe sleeping practices in its updated policy on reducing the risk of sudden infant death syndrome (SIDS).[21]

Falls. Falls are a leading cause of nonfatal injuries in children of all ages. Parental counseling has been effective in preventing infant falls, and window guards are highly effective in preventing serious injuries related to falls from windows.[24] Another significant cause of falls in infants—particularly falls down stairs—is the use of infant walkers. The AAP recommends banning the manufacture and sale of these devices because no benefit has been proven from their use, and they pose a substantial risk of injury or death.[18]

TODDLERS

Almost one third of injury-related deaths in toddlers result from motor vehicle crashes, and more than one fourth are the result of drowning.[1] Fires and burns also contribute significantly to injury-related mortality rates. Falls and poisonings are the leading causes of nonfatal injuries requiring hospitalization in this age group, followed by scald burns and motor vehicle–related injuries.

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Motor Vehicle Crashes. The correct use of age-appropriate child restraints and seat belts is an effective way to prevent or reduce injuries in the event of a motor vehicle crash. Laws requiring the use of seat belts and child restraints have increased their use.[25] However, incorrect use of child restraints remains a significant problem.[26]

Drownings. Pool fencing is effective in preventing drownings in residential swimming pools when the fence completely surrounds the pool, does not allow direct access from the house, has self-closing, self-latching gates, and is made of material that is difficult to climb.[16] However, young children

continue to be at risk of drowning in natural bodies of water (e.g., ponds, lakes, streams), bathtubs, buckets, and inadequately fenced or unfenced swimming pools. Drowning rates are highest in children one to three years of age. Drownings in this age group often occur during a brief lapse in supervision. The AAP recommends that children

TABLE 1
Evidence-Based Prevention Strategies for Childhood Injuries

Cause of injury	*High-risk groups*	*Prevention strategies*	*Evidence rating*	*References*
Bicycle crashes	School-age children	Approved bicycle helmet to reduce the risk of head injury after crashing	B	12
		Educational programs to increase helmet use	B	15
Drowning	Toddlers and school-age children	Fencing that completely surrounds pool and does not allow direct access from house. Fence should be made of material that is difficult to climb and have self-latching gates.	A	16
		Personal flotation devices around water	C	17
		Vigilant adult supervision	B	17
		Cardiopulmonary resuscitation training	B	12
Falls	Infants and toddlers	Avoiding the use of infant walkers	B	18
		Gates for stairways	C	19
		Releasable window guards or window stops above first floor	A	12
		Clinical counseling for parents to prevent falls	B	11
Fires and burns	Toddlers and school-age children	Properly installed and maintained smoke detectors	A	12
		Clinical counseling to increase smoke detector use	B	10
		Water heater temperature preset to less than 130°F (54.4°C)	A	12
Motor vehicle crashes	All children	Correct use of age-appropriate child restraints	A	12
		Clinical counseling to encourage correct use of child restraints	C	12, 20
Poisoning	Toddlers	Child-resistant packaging	A	12
Suffocation	Infants	Smoking cessation during pregnancy	B	21
		Recommending safe sleeping practices		
		Place infants on their backs to sleep	B	21
		Use a firm mattress that meets currently mandated safety standards	B	21
		Remove quilts, loose bedding, stuffed toys, and other soft objects from crib	B	21
		Keep infant's head uncovered	B	21
		Do not allow infant to share a bed with adults or other children	B	21
		Do not allow infant to sleep with adults on a sofa or recliner	B	21
		Consider offering a pacifier during sleep	C	21
		Avoid overheating	C	21
		Avoid commercial devices marketed to reduce the incidence of sudden infant death syndrome (e.g., monitors, wedges to maintain sleeping position)	C	21

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Information from references 10 through 12 and 15 through 21.

four years and younger never be left alone or in the care of another child while in bathtubs, pools, or spas, or when they are near open water. The AAP further recommends that adults supervise children from within an arm's length and refrain from distracting activities whenever children are in or around water.[17]

Fires and Burns. Scalding is a leading cause of hospitalization for burns in toddlers. An effective strategy for preventing injuries from scald burns is reducing the temperature of hot water heaters to less than 130° F (54.4° C).[27]

Children playing with matches and lighters are a significant cause of house fires[28]; parents should be counseled to store these items out of children's reach. Injuries and deaths from house fires can be prevented by properly installing and maintaining residential smoke detectors.[29] Parents should note that young children often do not know what to do when the smoke detector sounds and may be frightened by the noise; as a result, these children continue to be at high risk of injury and death in house fires. The AAP recommends counseling parents about fire prevention (e.g., adequate supervision of children, use of smoke alarms, teaching young children what to do when the smoke alarm sounds).[30]

Poisoning. Poisoning continues to be a leading cause of injury-related hospitalization among toddlers, even after implementation of the Poison Prevention Packaging Act of 1970. The AAP recommends against using syrup of ipecac, which is not effective in completely removing poison from the stomach.[31] Syrup of ipecac often is administered when it is contraindicated or not necessary, and it may result in intractable vomiting that prohibits the use of other orally administered poison treatments, such as activated charcoal and acetylcysteine.[31]

Another ineffective poison prevention strategy for toddlers is the use of "Mr. Yuk" poison warning stickers. These stickers display a green scowling face with a protruding tongue and were designed to be placed on hazardous substances to discourage children from handling the containers or ingesting the poison. However, studies have shown that supplying the stickers to families with young children does not reduce the risk of poisoning.[32] Furthermore, labeling containers with the stickers does not deter young children from touching, holding, or attempting to open the labeled containers.[33]

SCHOOL-AGE CHILDREN

Most fatal injuries in school-age children are the result of motor vehicle crashes (58 percent), drownings (10 percent), and fires and burns (8 percent).[1] Nonfatal injuries resulting in hospitalization most commonly are caused by falls and by bicycle and pedestrian-related crashes.

In addition to appropriate restraints in passenger vehicles, the AAP recommends that children should not travel in the cargo areas of pickup trucks. Children younger than 16 years should not use off-road vehicles or ride on lawn mowers.

Most fatal injuries in school-age children are the result of motor vehicle crashes, drownings, and fires and burns.

Bicycle helmets are effective in reducing the risk of head injury in the event of a crash.[34] Interventions such as legislation, educational programs, and subsidies may be effective for increasing the use of bicycle helmets, especially among younger children.[15,35] Furthermore, several studies have found that interventions that effectively increase bicycle helmet use also reduce rates of bicycle crash–related head injuries.[36] Parental involvement and riding partners (including parents or other adults) who also wear helmets increase the effectiveness of educational programs.[36] Protective gear for inline skating, skateboarding, and scooter riding also is recommended.

ADOLESCENTS

Motor vehicle crashes are the leading cause of injuries and all-cause mortality in adolescents.[1,13] Teenage drivers have high crash rates, primarily because of inexperience and risky driving behaviors (e.g., speeding, tailgating). Nighttime driving is risky for teenagers, as is driving with teenage passengers.[37]

Wearing a seat belt effectively reduces or prevents injury in the event of a crash.[38]

Parental management of teenage driving is a promising component of an effective injury prevention strategy.[39] Driver's education courses are not effective in preventing crashes, and some evidence suggests that these courses actually may increase teenagers' crash risk if participation results in earlier licensure.[40]

Counseling Recommendations

Priority topics for office-based injury prevention counseling include the use of motor vehicle restraints, smoke detectors, and pool fencing; reducing residential hot water temperature; the hazards of infant walkers; the safe storage of poisons and medications; and parental supervision.[41] The AAP has created the Injury Prevention Program for parents of children 12 years and younger. It can be accessed at http://www.aap.org/family/tippmain.htm. The program includes injury prevention counseling guidelines and schedules for providers, safety surveys designed to assess parents' specific educational needs, and age-specific parent education handouts for use in providing anticipatory guidance in primary care offices.[19] This program has been shown to be cost-effective.[42]

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