

# Promoting Childhood Water Safety: The Physician's Role

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## ABSTRACT

Injuries and deaths secondary to drowning are a significant issue for children. The risks associated with drowning change with a child's age and developmental abilities. Nationally, children under the age of 4 years and male adolescents represent the pediatric groups with the highest rates of drowning. In Wisconsin, 1998-2002, preteen children were involved in drowning or near-drowning events more often than teens, with boys being involved more than 2 times as often as girls for all childhood ages assessed. The drowning gender disparity is even greater among adults. Physicians are in a position to promote water safety for their patients and the community by educating families on age-appropriate drowning-prevention methods, supporting community safety campaigns, and advocating for "best practice" drowning-prevention legislation. Although injury prevention anticipatory guidance is important for all family members, directing the message to males is particularly important. Physicians can help children enjoy the benefits of water recreation while decreasing the risk for water-associated injury.

## INTRODUCTION

Water recreation provides hours of enjoyment and exercise for children, but water and children can be a dangerous mix. Unintentional injury remains the leading cause of death for children 1-18 years old in Wisconsin and nationally. Drowning events consistently rank as the second most common cause of unintentional in-

jury deaths, following motor vehicle collisions.<sup>1</sup> Table 1 shows the number of deaths and hospitalizations secondary to water injury for Wisconsin children and adults, 1998-2002, the most recent 5-year period for which data is available.<sup>2</sup> On average there were 18 childhood deaths and 35 hospital admissions per year due to submersion events. Table 1 shows that drowning or near drowning episodes occur in children of all ages, with males more than 2 times as likely to be involved. The risk factors associated with drowning change throughout the various stages of childhood development. Physicians who understand the appropriate risk factors and prevention measures for each age group can effectively promote water safety by educating families, supporting local community safety efforts, and advocating for legislation that supports water safety measures.

## CHILDREN UNDER 1 YEAR

The bathtub represents the single most dangerous location for deaths due to drowning for children during their first year of life. Brenner found that 71% of all infant drowning reported during 1995 occurred in a bathtub.<sup>3</sup> Most of these children were left alone for only a few moments, and were often under the charge of a preschool-aged sibling. Infant tub seat and ring devices can also give parents a false sense of security that their child is safe when alone in the tub.<sup>4</sup> Large, 5-gallon household buckets also present a risk to infants and small children; 16% of all infant drownings in 1995 were associated with buckets.<sup>3</sup> The common 5-gallon bucket is usually just over 30 cm tall, and when half full weighs more than 9 kg. The half-full bucket is heavier than the average 9-month-old, and half the infant's height. Infants and young toddlers are naturally "top-heavy" and can easily fall headfirst into a bucket without knocking it over, become trapped, and drown in a matter of minutes. The mainstay of drowning prevention for infants is adult supervision. Parents/caretakers should be educated that infants should never be left alone, even briefly, while the child is in the bath

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**Table 1.** Wisconsin Age-Associated Water Injury Deaths and Hospitalizations\* by Gender, 1998-2002.<sup>2</sup>

	Newborn-5 years		6-11 years		12-17 years		18+ years	
	D	H	D	H	D	H	D	H
Male	24	64	19	37	21	22	204	50
Female	17	38	8	16	2	2	56	18
Totals	41	102	27	53	23	24	260	68

D = Deaths; H = Hospitalizations  
\*E codes: 910.1, .2, .3, .4, .8, .9

**Table 2.** Pool Safety Barrier Guidelines<sup>5</sup>

- Top of the barrier should be at least 48 in above the ground.
- Maximum vertical clearance between the ground and bottom of the barrier should be 4 in.
- You should not be able to pass a 4-in diameter ball through any openings of the barrier.
- For fences consisting of horizontal and vertical pieces, where the horizontal pieces are less than 45 in apart, the vertical pieces should not be more than 1 3/4 in apart, to prevent a child from climbing over.
- For fences consisting of horizontal and vertical pieces where the horizontal pieces are at least 45 in apart, the vertical pieces should not be more than 4 in apart.
- Mesh size for a chain link fence should not be larger than 1 3/4 in.
- Solid barriers should not have any indentations or protrusions that might serve as a foothold.
- Access gates should open outward and away from the pool. They should be self-closing and self-latching.
- Pool fencing should be 4-sided in order to prevent access directly from the house to the pool. If a wall of the house serves as a side of the barrier, any doors or windows on that wall should be equipped with an audible alarm that sounds for at least 30 seconds within 7 seconds of being opened.

or near any open standing water including pools, spas, toilets, and buckets. Emphasize that neither the presence of a preschool- or school-age sibling, nor the use of a tub seat or ring constitute appropriate supervision or prevention. Buckets and tubs should be emptied as soon as possible. The American Academy of Pediatrics (AAP) also recommends that all parents and caregivers know CPR so that they can attempt to revive any child in the event of a near-drowning episode.<sup>6</sup>

### CHILDREN AGE 1-4 YEARS

The majority of the US drowning deaths in children 1-4 years old occurs in residential swimming pools.<sup>3</sup> When Wintemute examined the rates of drowning in children in Sacramento County, he found that more than twice as many children under 5 years old drowned in swim-

ming pools compared to other freshwater sources.<sup>7</sup> Approximately 65% of pool-related deaths occurred at the child's own home; the majority of the time, caregivers did not expect the child to be near the pool. Many children who drown are out of a caregiver's sight for less than 5 minutes.<sup>8</sup>

When constructed under the proper specifications, 4-sided fences surrounding swimming pools have long been shown to decrease the risk of drowning in a pool (Table 2). Guidelines for the height and type of fencing are based on studies done in Australia to determine the minimum height that would deter the majority of active and energetic young children from overcoming a barrier.<sup>9,10</sup> Estimates place pools without fencing as 2-5 times more likely to be involved in a drowning incident than fenced-in pools.<sup>11</sup> Four-sided fencing with a self-closing and self-latching gate that opens outward provides the best obstacle to limit unanticipated access to a pool.<sup>12</sup> The Consumer Product Safety Commission (CPSC), child safety organizations, and parent advocates recently held a series of national hearings and meetings regarding pool and spa safety.<sup>13</sup> A federal regulation mandating the proper enclosure of all public and private pools was a repeated recommendation voiced at the CPSC hearings. Although individual municipalities in Wisconsin may have local regulations regarding pool fencing, the state statute only calls for fencing around public pools. A public pool is defined as a pool that serves 3 or more residential dwellings. Physicians, parents, and other child safety organizations should advocate for evidence-based "best practice" state and federal regulations calling for mandatory proper fencing around all pools, public and private.<sup>12</sup>

Rigid safety covers and pool alarms are additional devices that can potentially increase the safety of a pool. However, they need further study to prove their value and should never take the place of a fence enclosure. Floating solar covers, on the other hand, can increase the danger to young children and even adults and should be avoided. Floating covers can support the weight of a ball or toy but not the weight of a child. A child enticed to the pool surface by a cover-supported toy can slip under the cover when trying to retrieve the object; once under the covered surface the child is hidden from sight and rescue.<sup>14</sup>

Children 1-4 years old generally do not have the developmental capacity to learn how to swim well. The AAP does not recommend formal swimming lessons for children until they are at least 4 years old.<sup>15</sup> There are a number of aquatic programs that focus on water

readiness and safety; it is important for parents to understand that participation in swim classes will neither “drown-proof” a child nor decrease the need for vigilant caregiver supervision when a child is near a body of water. Caregivers should practice “touch supervision,” never being out of arm’s length when a young child is in the water. Drowning can occur in a matter of minutes.

### SCHOOL AGE CHILDREN

The likelihood of drowning in a freshwater body of water, as compared with a swimming pool, increases steadily after 5 years of age. Across the United States, 54% of drowning in children 5-9 years old and 61% of drowning in children 10-14 years old took place in freshwater. This includes lakes, ponds, rivers, canals, and other natural sites.<sup>3</sup> Injuries related to boating and personal watercraft are also rising in school-aged and older children.<sup>16,17</sup>

Drowning prevention for school-aged children begins with swimming lessons. The AAP recommends that children learn to swim after their 4th birthday.<sup>6</sup> Being able to swim in the warm and controlled environment usually provided during a swimming lesson does not necessarily translate into survival skills in a natural body of water. Cooler water temperature, strong currents, thin ice, and murky water are all examples of conditions that can increase the risk of drowning, even for children who know how to swim well in a pool. Knowledge of water safety rules is just as important as the physical ability to swim. Children should never swim alone: the “buddy system” should always be used when children are playing in or near water.

US Coast Guard-approved personal flotation devices (PFD) or “life jackets” should be used whenever a child is on a boat, on personal watercraft, or participating in water sports. Water rings, cushions, and other objects designed for recreation are not appropriate substitutes. Wisconsin law does require children younger than 12 years old to wear an approved PFD while in a boat. Use of an approved PFD should be encouraged for all boaters, since such use has been shown to decrease the risk of drowning for all ages.

Several medical conditions receive special consideration. Children known to have epilepsy have a higher risk of drowning in pools and bathtubs than their counterparts without epilepsy.<sup>18</sup> A recent study has suggested that children with autism may also have a slightly increased risk of death due to drowning.<sup>19</sup> Children with epilepsy and autism should receive constant supervision when around bathtubs and pools. When children with epilepsy refuse to be supervised

during bathing for privacy reasons, showers are recommended as a safer alternative.

Recent studies have indicated that a small number of individuals with prolonged QT syndrome may be genetically predisposed to develop an arrhythmia while swimming.<sup>20</sup> Not enough information is yet available to determine the implications on water activity for individuals diagnosed with prolonged QT syndrome, however, water safety issues should be discussed with affected individuals and their families.

### ADOLESCENTS

Adolescents have the second highest national rate of drowning. Natural freshwater settings account for 69% of drowning deaths for the adolescent population, with the remaining deaths occurring in pools and saltwater.<sup>3</sup> National data from 2000-2001 show that among children age 15-19, drowning rates for black youth are nearly double the rates for white youth. The gender gap remains striking for adolescents, with a drowning rate for males almost 10 times the rate for females.<sup>1</sup> The gender gap is also true for drowning events in Wisconsin (Table 1). The reasons for these disparities are not entirely clear, but likely are related to differences in socioeconomic factors and differences in risk taking between boys and girls.<sup>3</sup> Given their high rate of drowning injury, a strong effort should be made to ensure that African-American families and all teen males repeatedly receive water safety information.

Drowning prevention in adolescents should start with reviewing the recommendations for school-aged children. In addition to the risk factors presented for school-aged children, the risk-taking behaviors common in the teenage years play a large part in drowning. Alcohol use is a particular problem, with almost 40% of drowning deaths occurring in people with a positive blood-alcohol level.<sup>7</sup> Abstaining from alcohol or drug use while in or near the water must be emphasized.<sup>21</sup> All 50 states have laws prohibiting the operation of a boat while intoxicated, even though regulations are variably enforced. The use of PFDs should also be strongly encouraged during boating and recreational water activity for the adolescent population. Diving injuries are another important consideration, and are also often related to alcohol use. Teens should be cautioned against diving into shallow or unfamiliar areas, and should always enter any body of water feet first.<sup>6</sup> Finally, adolescents should be encouraged to learn CPR as they are developmentally capable of providing this life-saving intervention if the need should arise.

**Table 3.** Modified National SAFE KIDS Campaign Water Safety Recommendations<sup>5,22</sup>

### Supervision

- Never leave a young child unsupervised in or around water, even for a moment.
- Never allow children to swim without supervision.
- Always designate a responsible adult to serve as the “water watcher”—a supervisor whose sole responsibility is to constantly observe children in or near the water.
- Supervisors should maintain continuous visual and auditory contact with children in or near the water, and should stay in close proximity (waterside).
- Supervisors should not engage in distracting behaviors such as talking on the phone, preparing a meal, or reading.
- Supervisors should keep young children within arm’s reach at all times (“touch supervision”).

### Environment

- Children should swim only in designated and supervised swimming areas.
- Four-sided isolation fencing at least 4 ft high and equipped with self-closing and self-latching gates should be installed around pools and spas to prevent direct access from a house or yard. Never prop open a gate to a pool barrier or leave toys in or around a pool that may attract young children.
- Install barriers of protection around your home pool or spa in addition to the fencing, such as pool alarms, door alarms, or locks.
- Limit access to water sources in the home by installing and using appropriate safety devices (such as door locks and toilet latches) and by emptying and inverting buckets and wading pools immediately after use.

### Gear

- Children should always wear appropriately sized US Coast Guard-approved PFDs when on boats, in or near open bodies of water, or participating in water sports. The PFD should fit snugly and not allow the child’s chin or ears to slip through the neck opening.
- Air-filled swimming aids, such as “water wings” and inner tubes, are not safety devices and should never be used as a substitute for a PFD.
- Rescue equipment, a telephone, and emergency phone numbers should be kept poolside.

### Education

- Children should be enrolled in swimming lessons at 4-8 years old. Look for classes that include emergency water survival techniques training.
- Parents and caregivers should learn infant and child CPR.
- Educate children about the rules of water safety:
  - Always swim with a buddy and an adult present.
  - Never swim in an open body of water or participate in water sports without wearing a PFD.
  - Never dive into a river, lake, or ocean; always enter feet first.
  - If someone is in trouble, call for help and throw something that floats to the victim.
- Educate teens about the risks of swimming while intoxicated; alcohol and water fun can be a deadly combination.

**Table 4.** Drowning Prevention Educational Material Resources

National SAFE KIDS Campaign  
www.safekids.org

American Academy of Pediatrics  
www.aap.org/family/tippmain.htm

Consumer Product Safety Commission  
www.cpsc.gov/epscpub/pubs/chdrown.html  
www.cpsc.gov/nsn/nsnposter.html

Accessed February 16, 2005.

## SUMMARY

Initiating age-appropriate discussions on water safety in a medical practice is the first step toward promoting drowning prevention in the community. The AAP strongly suggests making anticipatory guidance a regular part of pediatric office visits.<sup>23</sup> In addition, there is evidence that brief counseling on safe behaviors during emergency department visits can also result in behavior change and is considered effective by parents.<sup>24,25</sup> Working with community organizations such as SAFE KIDS is another way for physicians to contribute to a community’s water safety efforts. Table 3 is a modified SAFE KIDS water safety handout that summarizes many of the approaches discussed in this article. Other educational resources are listed in Table 4. Physicians can also advocate for state and federal “best practice” legislation regarding water safety. Extending Wisconsin’s pool enclosure regulations to all pools, both public and private, would reduce the number of drowning associated injuries and deaths in Wisconsin.

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