



# Policy Statement—Prevention of Drowning

COMMITTEE ON INJURY, VIOLENCE, AND POISON PREVENTION

## KEY WORDS

drowning prevention, pools, swimming lessons

## ABBREVIATIONS

CPR—cardiopulmonary resuscitation

AAP—American Academy of Pediatrics

CPSC—Consumer Product Safety Commission

SVRS—safety vacuum-release system

PFD—personal flotation device

CDC—Centers for Disease Control and Prevention

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## abstract

Drowning is a leading cause of injury-related death in children. In 2006, fatal drowning claimed the lives of approximately 1100 US children younger than 20 years. A number of strategies are available to prevent these tragedies. As educators and advocates, pediatricians can play an important role in the prevention of drowning. *Pediatrics* 2010;126:000

## INTRODUCTION

### Background

From 2000 to 2006, drowning was the second leading cause of unintentional injury death among US children between 1 and 19 years of age.<sup>1</sup> In 2006, drowning claimed the lives of approximately 1100 US children. Fortunately, childhood unintentional drowning fatality rates have decreased steadily from 2.68 per 100 000 in 1985 to 1.32 per 100 000 in 2006. Rates of drowning death vary with age, gender, and race. Age groups at greatest risk are toddlers and male adolescents. After 1 year of age, male children are at greater risk than are female children. Black and American Indian/Alaska Native children have higher drowning fatality rates than do white and Asian American children. From 2000 to 2006, the highest death rates were seen in white boys 0 to 4 years of age (3.53 per 100 000) and black male adolescents 15 to 19 years of age (4.46 per 100 000).<sup>1</sup> In 2008, approximately 3800 children younger than 20 years visited a hospital emergency department for a nonfatal drowning event, and more than 60% of those children were hospitalized.<sup>1</sup> Most victims of nonfatal drowning do well, but severe long-term neurologic deficits are seen with extended submersion times, prolonged resuscitation efforts, and lack of early bystander-initiated cardiopulmonary resuscitation (CPR).<sup>2–4</sup>

The American Academy of Pediatrics (AAP) has decided to revise this policy statement because of new information and research regarding (1) the World Health Organization's classification of drowning, (2) drain-entrapment and hair-entanglement injuries, (3) dangers of inflatable and portable pools, and (4) the possible benefit of swimming lessons for young children.

### Classification of Drowning

The World Congress on Drowning and the World Health Organization have revised the definition of drowning to be “the process of experiencing respiratory impairment from submersion/immersion in liquid.” Drowning outcomes are now to be classified as “death,” “no morbidity,” or “morbidity” (further categorized as “moderately disabled,” “severely disabled,” “vegetative state/coma,” and “brain death”). The new definition and classification are more consistent with other medical

conditions and injuries and should help in drowning surveillance and collection of more reliable and comprehensive epidemiologic information.<sup>5</sup>

### **Drain Entrapment and Hair Entanglement**

From 1990 to 2004, 74 cases (13 deaths) of body entrapment in a pool or spa drain were reported to the Consumer Product Safety Commission (CPSC).<sup>6</sup> In a separate report, 24 additional cases (2 deaths) were reported in the 3 years from 2005 to 2007.<sup>7</sup> The situation often involves a child playing with an open drain, inserting a hand or foot into the pipe, and then becoming trapped by increasing suction that causes tissue swelling. In the same time period (1990–2004), 43 incidents (12 deaths) of hair entanglement were reported.<sup>6</sup> These incidents typically involve females who are underwater with their long hair near a suction outlet. The water flow into the drain sweeps the hair into and around the drain cover, where it becomes tangled in the holes and protrusions of the cover. Entrapment and entanglement can be prevented by the use of special drain covers, safety vacuum-release systems (SVRSs), filter pumps with multiple drains, and a variety of other pressure-venting filter-construction techniques.<sup>6</sup> In 2007, Congress passed the Virginia Graeme Baker Pool and Spa Safety Act (effective December 2008), which requires special drain covers, unblockable drains, and SVRSs for all public pools and spas in the United States.<sup>8</sup>

### **Inflatable, Portable Pools**

Recently there was an increase in sales of large, inexpensive, inflatable or portable above-ground pools, which come in various sizes, shapes, and water depths. The pools are 18 to 48 in deep and can hold less than 200 to more than 5000 gallons of water. Some models even require filtration equip-

ment. Prices range from \$50 to \$750.<sup>9</sup> From 2004 to 2006, the CPSC reported 47 deaths of children related to inflatable pools.<sup>10</sup> Unfortunately, many parents do not consider fencing for an inflatable or portable pool, and such pools often fall outside of local building codes that require pool barriers. Because they contain such large amounts of water, these pools are often left filled for weeks at a time, which presents a continuous danger. The soft sides of some models allow children to lean over them and easily fall into the pool headfirst.

### **Swimming Lessons for Young Children**

The position of the AAP has been that children are not developmentally ready for swimming lessons until after their fourth birthday.<sup>11</sup> This position was based on (1) lack of data needed to determine if infant and toddler aquatic programs increase or decrease the likelihood of drowning, (2) concerns that such programs would cause parents to develop a false sense of security and lead them to provide inadequate supervision around water, and (3) evidence that starting swimming lessons at a very young age does not result in earlier development of proficient swimming skills.<sup>12,13</sup> In addition, there was concern that swimming programs might reduce a child's fear of water and unwittingly encourage the child to enter the water without supervision.

A recently published case-control study report from the Eunice Kennedy Shriver National Institute of Child Health and Human Development concluded that swimming lessons do not increase the risk of drowning in 1- to 4-year-olds and may actually provide a reduction in drowning risk in this age group. Drowning victims were less likely than matched controls (3% vs 26%, respectively) to have had formal

swimming instruction.<sup>14</sup> A Chinese study of swim instruction revealed similar drowning-protection statistics.<sup>15</sup> In light of this new research, it is reasonable for the AAP to relax its policy regarding the age at which children should start learning water-survival skills (see recommendation 6). The evidence no longer supports an advisory against early aquatic experience and swimming lessons for children of any specific age. However, the current evidence is insufficient to support a recommendation that all 1- to 4-year-old children receive swimming lessons. It must be stressed that even advanced swimming skills will not always prevent drowning and that swimming lessons must be considered only within the context of multilayered protection with effective pool barriers and constant, capable supervision. In addition, the possible benefit of early swimming instruction must be weighed against the potential risks (eg, hypothermia, hyponatremia, infectious illness, and lung damage from pool chemicals).<sup>16–19</sup>

In recent years, water-survival skills programs designed for infants younger than 12 months have become popular both in the United States and internationally. Many movies of tiny infants who have been taught to swim underwater, float fully clothed on their backs, and even cry out for help have emerged on the Internet. Although there are anecdotal reports of infants who have “saved themselves,” no scientific study has clearly demonstrated the safety and efficacy of training programs for such young infants.

Additional details regarding childhood drowning are available in the accompanying technical report, available online.<sup>20</sup>

## **PREVENTION OF DROWNING**

Supervision of young children around any water is an essential preventive

strategy, but inevitable lapses make supervision alone insufficient.<sup>21</sup> Installation of 4-sided fencing that completely isolates the pool from the house and yard is effective in preventing more than 50% of swimming-pool drownings of young children.<sup>21,22</sup> Some new, but limited, data suggest that swimming and water-survival skills training may lower drowning rates in 1- to 4-year-old children.<sup>23</sup> Lifeguards, personal flotation devices (PFDs), and CPR training seem to be effective<sup>2,24–26</sup>; however, data regarding the value of other potential preventive strategies, such as pool covers and pool alarms, are lacking. Interventions to prevent drowning are discussed in detail in the accompanying technical report, available online.<sup>20</sup>

As part of routine anticipatory guidance, pediatricians may use direct counseling, handouts, Web sites, and other educational methods to alert parents to the dangers that water presents at different ages and in different situations (see Appendix 1 for a list of resources). In addition to providing generic water-safety advice, pediatricians can provide specific targeted messages to children identified as having special risks of drowning.

1. Parents and caregivers need to be advised that they should never—even for a moment—leave small children alone or in the care of another young child while in bathtubs, pools, spas, or wading pools or near irrigation ditches or other open standing water. Because infant bath seats can tip over and children can slip out of them, bath seats cannot be a substitute for adult supervision.<sup>27</sup> Water should be emptied from containers, such as large pails and 5-gallon buckets, immediately after use. To prevent drowning in toilets, young children should not be left alone in the bathroom, and unsupervised

access to the bathroom should be prevented.

2. Whenever infants and toddlers (or weak swimmers) are in or around water, be it in a pool or an open body of water, a supervising adult with swimming skills should be in the water, within an arm's length, providing "touch supervision." With older children and better swimmers, the eyes and attention of the supervising adult should be constantly focused on the child, and the adult should not be engaged in other distracting activities that can compromise this attention, such as talking on the telephone, socializing, tending chores, or drinking alcohol. Supervision needs to be close, constant, and capable. In case of an emergency, the supervising adult must know how to swim, perform a rescue, initiate CPR, and call for help. If children are in out-of-home child care, parents should inquire about exposure to water and water-related activities at the provider's site or during off-site visits. Recommendations for child-to-staff ratios while children are wading or swimming are available and vary according to the age of the child and according to jurisdiction. Some states include staffing ratios for water activities in their child care and school licensing requirements.<sup>28</sup> Parents should be aware of the ratios at their child's site of care. National recommendations are available from the AAP.<sup>28</sup>
3. Pediatricians are encouraged to identify families who have residential (home and apartment complex) swimming pools and include periodic drowning-prevention counseling during routine health visits (see Appendix 2 for an office-based quiz that can be used to ini-

tiate a discussion about pool safety). It is important to ask specifically about portable and inflatable above-ground pools, because so many of these types of pools do not have adequate protective fences and barriers.<sup>9</sup> Families (and extended families and others visited by children) should be advised to install an isolation fence (also referred to as a 4-sided fence) that prevents direct access to the pool from the house. The fence should be at least 4 ft high (or higher if required by local ordinance). The fence should also be climb resistant. For example, chain-link fences can be scaled easily by young children, whereas ornamental iron-bar fences are more difficult to climb.<sup>29</sup> The distance between the bottom of the fence and the ground should be less than 4 in (some building codes suggest a 2-in limit). To prevent small children from squeezing through, the distance between vertical members of the fence should be less than 4 in. The gate is the single most important component of the fence. It should be self-latching and self-closing, with the latch placed at least 54 in above the bottom of the gate. The gate should open away from the pool, and should be checked often to ensure that it is in good working order. Detailed guidelines for safety barriers for home pools are available online from the CPSC.<sup>30</sup>

4. Although data are lacking, families can also be advised to consider supplemental pool alarms and rigid pool covers as additional layers of protection; however, neither alarms nor pool covers are a substitute for adequate fencing. It is important to note that some types of pool covers, such as thin plastic solar covers, should not be

used as a means of protection, because children may try to walk on the cover, fall into the pool, and be hidden from view.

5. Body entrapment and hair entanglement in pool and spa drains were recently recognized as potential dangers to children.<sup>31</sup> Entrapment and entanglement injuries can be prevented by the use of special drain covers, SVRSs, filter pumps with multiple drains, and a variety of other pressure-venting filter-construction techniques.<sup>6</sup> Managers of public pools and owners of private pools and spas must be made aware of entrapment/entanglement risks and encouraged to install the drain covers and filter-pump equipment needed to prevent these injuries.
6. Children need to learn to swim. The AAP continues to support swimming lessons for most children 4 years old and older. Because children develop at different rates, not all children will be ready to learn to swim at exactly the same age. For example, children with motor or cognitive disabilities may not be ready for swimming lessons until a later age. The evidence no longer supports an advisory against early aquatic experience and swimming lessons for children of any specific age. However, the current evidence is insufficient to support a recommendation that all 1- to 4-year-old children receive swimming lessons. A parent's decision about starting swimming lessons or water-survival skills training at an early age must be individualized on the basis of the child's frequency of exposure to water, emotional maturity, physical limitations, and health concerns related to swimming pools (ie, hypothermia, hyponatremia, infectious illness, and lung damage from pool chemicals). Parents should be reminded that swimming lessons will not provide "drown-proofing" for children of any age. It is important that swim instructors stress this message as well as the need for constant supervision around water. Swimming skills are just one potential prevention strategy that must be considered in the context of a multifaceted approach that includes effective barriers, appropriate adult supervision, and training in CPR. Knowing how to swim well in a swimming pool does not necessarily make a child safe in natural water environments. Children need to be taught never to swim alone and not to swim without adult supervision.
7. Parents, caregivers, and pool owners should learn CPR and keep a telephone and equipment approved by the US Coast Guard (eg, life buoys, life jackets, and a reach tool such as a shepherd's crook) at poolside. Older children and adolescents should learn CPR, and pediatricians should support the inclusion of CPR training in high school health classes.
8. Parents should be cautioned not to use air-filled swimming aids (such as inflatable arm bands) in place of PFDs (life jackets). These aids can deflate and are not designed to keep swimmers safe.
9. All children should be required to wear an approved PFD whenever they are riding in watercraft. Small children and nonswimmers should use PFDs when they are at water's edge, such as along a river bank or on a dock or pier. Pediatricians should encourage all family members to wear PFDs to model safe behavior. Information about PFDs is available from the US Coast Guard Web site.<sup>32</sup>
10. Parents and children need to understand that jumping or diving into water can result in injury. Parents should know the depth of the water and the location of underwater hazards before permitting children to jump or dive. The first entry into any body of water should be feetfirst.
11. When selecting an open body of water in which their children will swim, parents should select sites with lifeguards. Even for the strongest of swimmers, it is important to consider weather, tides, waves, and water currents in selecting a safe location for recreational swimming. Swimmers should know what to do in case of rip currents (swim parallel to the shore until out of the current, then swim back toward the shore).
12. Parents and children need to recognize drowning risks in cold seasons. Children should refrain from walking, skating, or riding on weak or thawing ice on any body of water.
13. When swimming or taking a bath, children of any age with seizure disorders should be supervised closely by an adult at all times.<sup>33</sup> Showers are preferable to baths for situations in which the child cannot be supervised directly because of privacy issues.
14. Counseling parents and adolescents about water safety provides an opportunity to stress the problems related to illegal alcohol and drug use during any activity. Specifically, the discussion should include a warning about the increased drowning rates that result from impairment of a swimmer or watercraft occupant when alcohol or illicit drugs are used.

Because male adolescents are at much higher risk of water-based injuries than are female adolescents, they warrant extra counseling.

## COMMUNITY INTERVENTIONS

1. Pediatricians are encouraged to work in their communities to pass legislation to mandate 4-sided isolation pool fencing for all new and existing residential pools. Pediatricians should encourage local governmental inspection of pool fencing with strict enforcement programs, because they have been shown to be effective in reducing drowning.<sup>34</sup>
2. Pediatricians should support efforts to ensure that community pools and other pools accessible to the public (such as pools at apartments, hotels, and motels) have certified lifeguards with current CPR certification. (Currently, most states do not require hotel pools to have lifeguards.)
3. Pediatricians are encouraged to support efforts in their states and communities to pass legislation and adopt regulations to establish basic safety requirements for natural swimming areas and public and private recreational facilities (eg, mandating the presence of certified lifeguards in designated swimming areas).
4. Pediatricians should support state and community efforts to enforce laws that prohibit alcohol and other drug consumption by boat occupants, not just operators.
5. Pediatricians should work with state and local emergency medical services personnel to encourage systematic reporting of information on the circumstances of immersion events. Consistent review of these data is critical for the development of drowning-prevention

strategies appropriate for the geographic area.

6. Pediatricians should work in their communities to ensure adequate emergency medical services for childhood drowning victims. The Emergency Medical Services for Children (EMSC) program should be reauthorized and funded at levels recommended by the Institutes of Medicine.
7. Supportive counseling services should be available to relatives and friends of drowning victims.

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## APPENDIX 1: RESOURCES FOR PEDIATRICIANS

1. American Academy of Pediatrics ([www.aap.org](http://www.aap.org))—Contains educational materials for parents from The Injury Prevention Program (TIIPP) about home water hazards for young children, life jackets, pool

safety, and water safety for school-aged children; also has links to water-safety information from the CPSC, Centers for Disease Control and Prevention (CDC), and SafeKids.

2. Safe Kids USA ([www.usa.safekids.org/water](http://www.usa.safekids.org/water))—Contains information about pools and hot tubs, drain covers and SVRSs to prevent entrapment, and safety checklists (English and Spanish) about pools, spas, open-water swimming and boating, and home water safety; also has links to national research study about pool and spa safety; has some nice materials for children including boating safety coloring pages; has a color “Water Watcher” badge available for download.
3. Centers for Disease Control and Prevention (CDC) ([www.cdc.gov](http://www.cdc.gov))—Contains a water-related injuries fact sheet, CDC research and information on water safety and water-related illnesses and injuries, and a link to the Web-based Injury Statistics Query and Report System (WISQARS); the CDC Childhood Injury Report contains state-specific information about drowning and other injuries (available at: [www.cdc.gov/safecild/images/CDC-childhoodinjury.pdf](http://www.cdc.gov/safecild/images/CDC-childhoodinjury.pdf)).
4. Consumer Product Safety Commission (CPSC) ([www.cpsc.gov](http://www.cpsc.gov))—Contains information about the Virginia Graeme Baker Pool and Spa Safety Act and a list of manufacturers of approved drain covers and SVRSs; the publications section contains safety-barrier guidelines for home pools and a family education brochure about preventing childhood drowning.
5. US Coast Guard ([www.uscgboating.org](http://www.uscgboating.org))—Contains detailed information and tip sheets about inflatable and foam-filled PFDs, vessel safety checks, approved on-line boating safety courses, and beach safety; also has links to sites with informa-

tion about safety and boating regulations, as well as statistics, research, and surveys about boating and boating crashes and injury.

**APPENDIX 2: DROWNING-PREVENTION QUESTIONNAIRE (FOR OFFICE WATER-SAFETY COUNSELING)**

**Quiz**

1. Which of the pictures in Figure 1 looks the most like your backyard pool area?

2. In Figure 2, can you find 3 things that are dangerous?

3. How would you supervise a 3-year-old child around water?

- A. Always be close enough to *see* the child.
- B. Always be close enough to *hear* the child.
- C. Always be close enough to *touch* the child.

4. At what age can you leave a child alone in the bathtub?

A. As young as 2 years old, if you have a special bath seat or ring.

B. 3 years old.

C. Approximately 6 years old.

5. How many children and teenagers died from drowning in the United States in the past 3 years?

A. 500

B. 1000

C. More than 3000

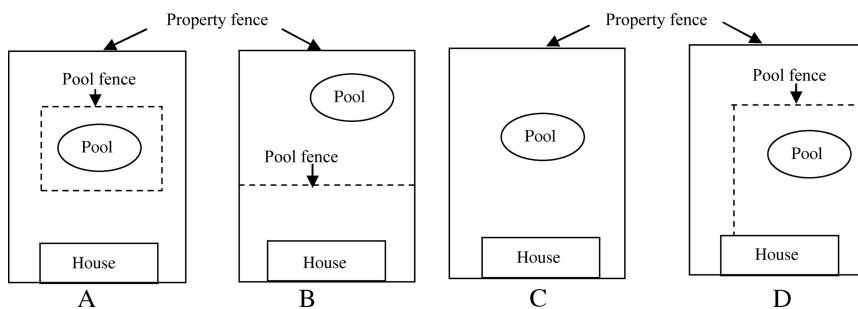


FIGURE 1

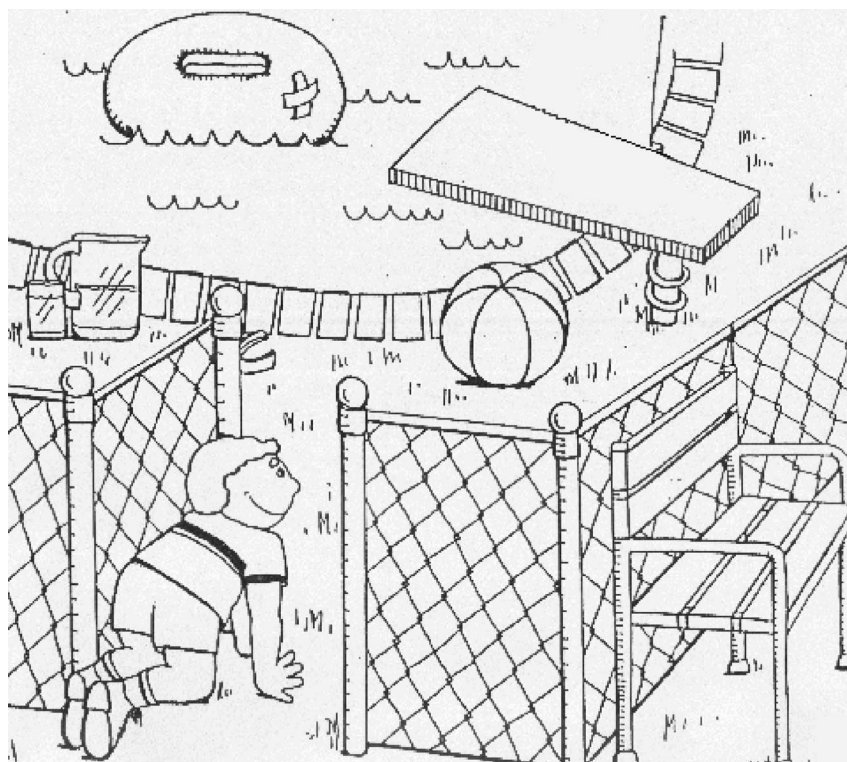


FIGURE 2

## Quiz Answers

### Question 1

- A. **TERRIFIC!** A fence that surrounds the pool on all 4 sides is the safest. But remember, even with a good fence, children can drown if not supervised very carefully around water. The fence, gate, and latch have to be well maintained to make sure children cannot enter the pool area.
- B. **GOOD!** This arrangement is good, because it will keep kids from getting out of the house and into the pool. It is important that kids playing in the pool area be well supervised—that means you can't be reading, talking on the phone, or involved in distracting conversations.
- C. **DANGER!** This arrangement is not safe. Children playing in the backyard can easily get to the pool. A child could also sneak out the back door, back windows, or even through a pet door!
- D. **DANGER!** Although there is a fence around the pool area, a child could enter the pool area from a door or window at the back or side of the house!

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### Question 2

- A. The gate is open. You should never prop the gate open! Make sure that the automatic self-closing and self-locking mechanisms are working at all times.
- B. The ball and pool toys will attract the child into the pool area.
- C. Children can climb up on furniture to get over the fence and into the pool area. It would be better to keep the pool furniture inside the fence.
- D. No glass or breakables should be in the pool area.
- E. The fence design (chain-link) would allow a child to climb over it.

### Question 3

C is the correct answer. You should always be close enough to *touch* your child when near the swimming pool. Pools can be as dangerous as a street, and you'd always hold your child's hand when crossing the street. It is hard, almost impossible, to watch your child all the time. It is easy to get distracted and look away. Remember that it only takes a few seconds for a child to fall into the pool. Drowning is a quick and quiet

death, most kids don't thrash around and yell when they fall into the pool; they just sink to the bottom without splashing or crying out!

### Question 4

C is the correct answer. Every year in the United States, several children drown in the bathtub. Bathtub seats and rings can topple over and are not safe. Some infants have died when an older brother or sister was supposed to be watching them in the tub. Only an adult or teenager should supervise bath time. And, be careful with toilets and buckets—kids have drowned in these too! We suggest that all kids under the age of 6 be watched carefully while in the bathtub.

### Question 5

C is the correct answer. There have been more than 3000 children and teenagers who have died from drowning in the United States in the past 3 years. Several hundred survivors are victims of severe, permanent brain damage. These kids are from all cultural and economic backgrounds.

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