



# Prevention of Drowning

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Drowning is a leading cause of injury-related death in children. In 2017, drowning claimed the lives of almost 1000 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.

## BACKGROUND

Drowning is the leading cause of injury death in US children 1 to 4 years of age and the third leading cause of unintentional injury death among US children and adolescents 5 to 19 years of age.<sup>1</sup> In 2017, drowning claimed the lives of almost 1000 US children. Fortunately, childhood unintentional drowning fatality rates have decreased steadily from 2.68 per 100 000 in 1985 to 1.11 per 100 000 in 2017. Rates of drowning death vary with age, sex, and race and/or ethnicity, with toddlers and male adolescents at highest risk. After 1 year of age, male children of all ages are at greater risk of drowning than female children. Overall, African American children have the highest drowning fatality rates, followed in order by American Indian and/or Alaskan native, white, Asian American and/or Pacific Islander, and Hispanic children. For the period 2013–2017, the highest drowning death rates were seen in white male children 0 to 4 years of age (3.44 per 100 000), American Indian and/or Alaskan native children 0 through 4 years (3.58), and African American male adolescents 15 to 19 years of age (4.06 per 100 000).<sup>1</sup>

Drowning is also a significant source of morbidity for children. In 2017, an estimated 8700 children younger than 20 years of age visited a hospital emergency department for a drowning event, and 25% of those children were hospitalized or transferred for further care.<sup>1</sup> Most victims of nonfatal drowning recover fully with no neurologic deficits, but severe long-term neurologic deficits are seen with extended submersion times (>6 minutes), prolonged resuscitation efforts, and lack of early bystander-initiated cardiopulmonary resuscitation (CPR).<sup>2–4</sup>

The American Academy of Pediatrics issues this revised policy statement because of new information and research regarding (1) populations at

## abstract

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increased risk, (2) racial and sociodemographic disparities in drowning rates, (3) water competency (water-safety knowledge and attitudes, basic swim skills, and response to a swimmer in trouble),<sup>5,6</sup> (4) when children are in and around water (the need for close, constant, attentive, and capable adult supervision and life jacket use in children and adults), (5) when children are not expected to be around water (the importance of physical barriers to prevent drowning), and (6) the drowning chain of survival and importance of bystander CPR (Table 1).

### CLASSIFICATION OF DROWNING

In 2002, the World Congress on Drowning and the World Health Organization revised the definition of drowning to “the process of experiencing respiratory impairment from submersion/immersion in liquid.” Drowning outcomes are classified as “death,” “no morbidity,” or “morbidity” (further divided into “moderately disabled,” “severely disabled,” “vegetative state/coma,” and “brain death”). The drowning process is a continuum that can be interrupted by rescue at any point in that process, with varying sequelae from no symptoms to death. Terms such as wet, dry, secondary, active, near, passive, and silent drowning should not be used. The 2002 revised definition and classification is more consistent with other medical conditions and injuries and should help in drowning surveillance and collection of more reliable and comprehensive epidemiological information.<sup>7</sup>

**TABLE 1** Top Tips for Pediatricians

Assess all children for drowning risk on the basis of risk and age and prioritize evidence-based strategies:

- barriers;
- supervision;
- swim lessons;
- life jackets; and
- CPR.

### POPULATIONS WITH INCREASED DROWNING RISK

Certain populations, because of behavior, skill, environment, or underlying medical condition, are at increased risk of drowning.

#### Toddlers

For the period 2013–2017, the highest rate of drowning occurred in the 0- to 4-year age group (2.19 per 100 000 population), with children 12 to 36 months of age being at highest risk (3.31). Most infants drown in bathtubs and buckets, whereas the majority of preschool-aged children drown in swimming pools.<sup>8</sup> The primary problem for this young age group is lack of barriers to prevent unanticipated, unsupervised access to water, including in swimming pools, hot tubs and spas, bathtubs, natural bodies of water, and standing water in homes (buckets, tubs, and toilets). The Consumer Product Safety Commission (CPSC) found that 69% of children younger than 5 years of age were not expected to be at or in the pool at the time of a drowning incident.<sup>9</sup>

#### Adolescents

Adolescents (15–19 years of age) have the second highest fatal drowning rate. In this age group, just less than three-quarters of all drownings occur in natural water settings, and this age group makes up half of childhood drownings in natural water.<sup>10</sup> In 2016, Safe Kids Worldwide reported that the natural water fatal drowning rate for adolescents 15 to 17 years old was more than 3 times higher than that for children 5 to 9 years old and twice the rate for children younger than 5 years of age.<sup>11</sup> The increased risk for fatal drowning in adolescents can be attributed to multiple factors, including overestimation of skills, underestimation of dangerous situations, engaging in high-risk and impulsive behaviors, and substance use.<sup>12</sup> Alcohol is a leading risk factor,

contributing to 30% to 70% of recreational water deaths among US adolescents and adults.<sup>13</sup>

### UNDERLYING MEDICAL CONDITIONS

#### Epilepsy

Drowning is the most common cause of death from unintentional injury for people with epilepsy,<sup>14</sup> and children with epilepsy are at greater risk of drowning, both in bathtubs and in swimming pools.<sup>15</sup> The relative risk of fatal and nonfatal drowning in patients with epilepsy varies greatly but is 7.5- to 10-fold higher than that in children without seizures<sup>15,16</sup> and varies with age, severity of illness, degree of exposure to water, and level of supervision.<sup>15–17</sup> Parents and caregivers of children with active epilepsy should provide direct supervision around water at all times, including swimming pools and bathtubs. Whenever possible, children with epilepsy should shower instead of bathe<sup>17</sup> and swim only at locations where there is a lifeguard. Children with poorly controlled epilepsy should have a discussion with their neurologist or pediatrician before any swim activity.

#### Autism

Children with autism spectrum disorder (ASD) are also at increased risk of drowning,<sup>18</sup> especially those younger than 15 years of age<sup>18</sup> and those with greater degrees of intellectual disability.<sup>19</sup> Wandering is the most commonly reported behavior leading to drowning, accounting for nearly 74% of fatal drowning incidents among children with autism.<sup>20</sup>

#### Cardiac Arrhythmias

Exertion while swimming can trigger arrhythmia among individuals with long QT syndrome.<sup>21</sup> Although the condition is rare and such cases represent a small percentage of drownings, long QT syndrome, as well as Brugada syndrome and

catecholaminergic polymorphic ventricular tachycardia, should be considered as a possible cause for unexplained submersion injuries among proficient swimmers in low-risk settings.<sup>22</sup>

### **SOCIODEMOGRAPHIC FACTORS**

There continue to be significant racial and socioeconomic disparities in drowning rates among children. For many, cultural beliefs and traditions may prevent children from swimming.<sup>23,24</sup> Furthermore, for some religious and ethnic groups, single-sex aquatic settings are required,<sup>25</sup> and clothing that protects modesty according to religious norms may not be allowed in some pools. Socioeconomically, the multiple swim lessons required to achieve basic water competency can be costly or difficult given limited access and transportation. Moreover, decreased municipal funding for swimming pools, for swimming programs, and for lifeguards has limited access to swim lessons and safe water recreational sites for many communities.

These barriers may be surmounted through community-based programs targeting high-risk groups by providing free or low-cost swim lessons, developing special programs to address cultural concerns as well as developing swim lessons for youth with developmental disabilities, changing pool policies to meet the needs of specific communities, using culturally and linguistically appropriate instructors to deliver swim lessons, and working with both health care and faith communities to refer patients and their families to swim programs.<sup>25-27</sup>

### **WATER COMPETENCY, SWIM LESSONS, AND SWIM SKILLS**

Water competency is the ability to anticipate, avoid, and survive common drowning situations.<sup>6</sup> The components of water competency

include water-safety awareness, basic swim skills, and the ability to recognize and respond to a swimmer in trouble. Swim lessons and swim skills alone cannot prevent drowning. Learning to swim needs to be seen as a component of water competency that also includes knowledge and awareness of local hazards and/or risks and of one's own limitations; how to wear a life jacket (previously referred to as "wearable personal flotation device"); and ability to recognize and respond to a swimmer in distress, call for help, and perform safe rescue and CPR.<sup>5</sup>

Evidence reveals that many children older than 1 year will benefit from swim lessons.<sup>28</sup> Swim lessons are increasingly available for a wide range of children, including those with various health conditions and disabilities such as ASD. A parent or caregiver's decision about when to initiate swim lessons must be individualized on the basis of a variety of factors, including comfort with being in water, health status, emotional maturity, and physical and cognitive limitations. Although swim lessons provide 1 layer of protection from drowning, swim lessons do not "drown proof" a child, and parents must continue to provide barriers to prevent unintended access when not in the water and closely supervise children when in and around water.

In contrast, infants younger than 1 year are developmentally unable to learn the complex movements, such as breathing, necessary to swim. They may manifest reflexive swimming movement under the water but cannot effectively raise their heads to breathe.<sup>29</sup> There is no evidence to suggest that infant swimming programs for those younger than 1 year are beneficial.

Basic swim skills include ability to enter the water, surface, turn around, propel oneself for at least 25 yards, float on or tread water, and exit the water.<sup>30</sup> Importantly, performance of

these water-survival skills, usually learned in a pool, is affected by the aquatic environment (water temperature, water depth, water movement, clothing, and distance), and demonstration of skills in 1 aquatic environment may not transfer to another. There is tremendous variability among swim lessons, and not every program will be right for each child. Parents and caregivers should investigate options for swim lessons in their community before enrollment to make sure that the program meets their needs and the needs of the child. High-quality swim lessons provide more experiential training, including swimming in clothes, in life jackets, falling in, and practicing self-rescue. Achieving basic water-competency swim skills requires multiple lessons, and acquisition of water competency is a protracted process that involves learning in conjunction with developmental maturation. There is a need for a broad and coordinated research agenda to address not only the efficacy of swim lessons for children age 1 to 4 years but also the many components of water competency for the child and parent or caregiver.

### **DROWNING-PREVENTION STRATEGIES**

The Haddon Matrix paradigm for injury prevention is used to identify interventions aimed at changing the environment, the individual at risk, and/or the agent of injury (in this case, water).<sup>31</sup> Experts generally recommend that multiple "layers of protection" be used to prevent drowning because it is unlikely that any single strategy will prevent drowning deaths and injuries. The Haddon Matrix (Table 2) reveals examples of interventions before the drowning event, during the drowning event, and after the drowning event at the levels of the individual, environment, and policy. Five major interventions are evidence based: 4-sided pool fencing, life jackets, swim

lessons, supervision, and lifeguards (with descending levels of evidence).

Installation of 4-sided fencing (at least 4 ft tall) with self-closing and self-latching gates that completely isolates the pool from the house and yard is the most studied and effective drowning-prevention strategy for the young child, preventing more than 50% of swimming-pool drownings of young children.<sup>32,33</sup> Life jackets are now also well proven to prevent drowning fatalities. Some data reveal that swim lessons may lower drowning rates among children,<sup>27</sup> including those 1 to 4 years of age.<sup>28</sup> Lifeguards and CPR training also appear to be effective.<sup>2,4,34-36</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 soon).

Inadequate supervision is often cited as a contributing factor for childhood drowning, especially for younger children.<sup>11,37,38</sup> Adequate supervision, described as close, constant, and attentive supervision of young children in or around any water, is a primary and absolutely essential preventive strategy.<sup>27</sup> For beginning swimmers, adequate supervision is “touch supervision,” in which the supervising adult is within arm’s reach of the child so he or she can pull the child out of the water if the child’s head becomes submerged under water. Evaluated interventions shown to increase the quality of supervision include swim lessons in which the need for continued

parental supervision is emphasized,<sup>39</sup> and a study in Bangladesh revealed that adult supervision, in addition to the physical barrier of playpens, significantly reduced the risk of drowning in children ages 1 to 5 years.<sup>27</sup> Supervision should include being capable of recognizing and responding appropriately to a child in distress. Supervision is critical for safety in children with ASD and other disabilities. The National Autism Association’s Big Red Safety Box<sup>40</sup> contains information for parents, schools, and first responders and suggests a safety plan in public places where there is a handoff of supervision so that children with ASD and other disabilities do not wander off.

Although supervision is an essential layer of protection when children are

**TABLE 2** Haddon Matrix for Drowning-Prevention Strategies

	Personal	Equipment	Physical Environment	Social Environment
Before the event	<b>Provide close, constant, and attentive supervision of children and poor swimmers</b>	<b>Install 4-sided fencing that isolates the pool from the house and yard</b>	<b>Swim where lifeguards are present</b>	Mandate 4-sided residential pool fencing
	Clear handoff supervision responsibilities	Install self-closing and latching gates	Attend to warning signage	Mandate life jacket wear
	<b>Develop water competency, including water-safety knowledge, basic swim skills, and ability to recognize and respond to a swimmer in trouble</b>	<b>Wear life jackets</b>	Swim at designated swim sites	Adopt the Model Aquatic Health Code
	Evaluate preexisting health condition	Install compliant pool drains	Remove toys from pools when not in use to reduce temptation for children to enter the pool	Increase availability of lifeguards
	Know how to choose and fit a life jacket	Install door locks	Empty water buckets and wading pools	Increase access to affordable and culturally compatible swim lessons
	Avoid substance use	Enclosures for open bodies of water	—	Close high-risk waters during high-risk times
	Know the water’s hazards, conditions	Promote life jacket-loaner programs	—	Develop designated open-water swim sites
	Swim at a designated swim site	Role model life jacket use by adults	—	Enforce boating under the influence laws
	<b>Learn CPR</b>	Make rescue devices available at swim sites	—	—
	Take a boater education course	Phone access to call for help	—	—
	—	Ensure functional watercraft	—	—
Event	Water-survival skills	Rescue device available	—	EMS system
After the event	<b>Early bystander CPR</b>	AED	—	Advanced medical care
	Bystander response	Rescue equipment	—	—

The Model Aquatic Health Code provides guidelines and standards for equipment, for staffing and training, and for monitoring swimming pools. Bold indicates the most evidence-based interventions. AED, automated external defibrillator.



expected to be in or around the water, barriers must be in place to prevent unintended access of children to water during nonswim times.

Drowning is silent and only takes a minute. Those children with highest drowning risk are 12 to 36 months of age. Developmentally, they are curious and lack the judgement or awareness of the dangers of water, so barriers, such as 4-sided fencing and door locks, are critical in preventing access when the caregiver is distracted by other children, meal preparation, etc.

The Model Aquatic Health Code,<sup>41</sup> developed by the Centers for Disease Control and Prevention (CDC), is based on science and best practices to help guide policy makers and aquatic leaders on pool and spa safety. The Model Aquatic Health Code provides guidelines and standards for equipment, for staffing and training, and for monitoring swimming pools. Similar attention and effort are needed for open-water swim sites.

### **DROWNING CHAIN OF SURVIVAL**

The drowning chain of survival (Fig 1) refers to a series of steps that, when enacted, attempt to reduce mortality associated with drowning. The steps of the chain are as follows: (1) prevent drowning, (2) recognize distress, (3) provide flotation, (4) remove from water, and (5) provide care as needed. The chain starts with prevention, the most important and effective step to reducing morbidity and mortality from drowning.<sup>42</sup> Rescue and resuscitation of a drowning victim must occur within minutes to save lives and reduce morbidity in nonfatal drownings and underscores the critically time-sensitive role of the parent or supervising adult.

### **IMPORTANCE OF BYSTANDER CPR**

Immediate resuscitation at the submersion site, even before the arrival of emergency medical services

(EMS) personnel, is the most effective means to improve outcomes in the event of a drowning incident.<sup>2,3</sup>

Prompt initiation of bystander CPR, with a focus on airway and rescue breathing before compressions<sup>43</sup> and activation of prehospital advanced cardiac life support for the pediatric submersion victim, have the greatest impact on survival and prognosis.<sup>4,44</sup> Current guidelines recommend that drowning victims who require any form of resuscitation (including only rescue breaths) be transported to the emergency department for evaluation and monitoring, even if they appear alert with effective cardiopulmonary function at the scene.<sup>43</sup>

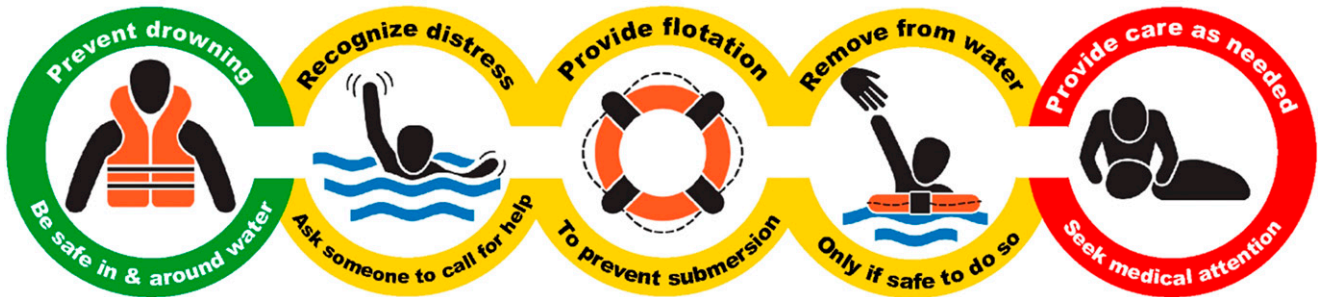
## **PREVENTION OF DROWNING RECOMMENDATIONS**

### **Parents and Caregivers**

1. Parents and caregivers should never (even for a moment) leave young children alone or in the care of another child while in or near bathtubs, pools, spas, or wading pools and when near irrigation ditches, ponds, or other open standing water.
2. Parents and caregivers must be aware of drowning risks associated with hazards in the home.
  - Infant bath seats can tip over, and children can slip out of them and drown in even a few inches of water in the bathtub. Infants should always be with an adult when sitting in a bath seat in a bathtub.<sup>45</sup>
  - Water should be emptied from containers, such as pails and buckets, immediately after use.
  - To prevent drowning in toilets, young children should not be left alone in the bathroom, and toilet locks may be helpful.
  - Parents and caregivers should prevent unsupervised access to the bathroom, swimming pool, or open water.
3. Whenever infants and toddlers (or noncompetent swimmers) are in or around water, a supervising adult with swim skills should be within an arm's length, providing constant touch supervision. Even with older children and better swimmers, the eyes and attention of the supervising adult should still be constantly focused on the child. This "water watcher" should not be engaged in other distracting activities that can compromise this attention, including using the telephone (eg, texting), socializing, tending chores, or drinking alcohol, and there needs to be a clear handoff of responsibility from one water watcher to the next. Supervision must be close, constant, and attentive. In case of an emergency, the supervising adult must be able to recognize a child in distress, safely perform a rescue, initiate CPR, and call for help. Parents need to recognize that lifeguards are only 1 layer of protection, and children in and near the water require constant caregiver supervision, even if a lifeguard is present.
4. To prevent unintended access, families should install a 4-ft, 4-sided isolation fence that separates the pool from the house and the rest of the yard with a self-closing, self-latching gate. Detailed guidelines for safety barriers for home pools are available online from the CPSC.<sup>46</sup> Families of children with ASD or other disabilities who are at risk for wandering off should identify local hazards and work with the community on pool fencing and mitigation of hazards.
5. Although data are lacking, families may consider supplemental pool alarms and weight-bearing pool covers as additional layers of protection;

# DROWNING CHAIN OF SURVIVAL

## A call to action



**FIGURE 1**

Drowning chain of survival. (Reprinted with permission from Szpilman D, Webber J, Quan L, et al. Creating a drowning chain of survival. *Resuscitation*. 2014;85[9]:1151.)

however, neither alarms nor pool covers are a substitute for adequate fencing and adult supervision. Importantly, some types of pool covers, such as thin plastic solar covers, should not be used as a means of protection because they might increase risk of drowning.

6. Parents, caregivers, and pool owners should learn CPR and keep a telephone and rescue equipment approved by the US Coast Guard (eg, life buoys, life jackets, and a reach tool such as a shepherd's crook) poolside. Older children and adolescents should learn CPR.
7. Children and parents should learn to swim and learn water-safety skills. Because children develop at different rates, not all children will be ready to learn to swim at exactly the same age. There is evidence that swim lessons may reduce the risk of drowning, including for those 1 to 4 years of age. A parent's decision about starting swim 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 and cognitive limitations, and health concerns related to swimming pools.

Parents should be reminded that swim lessons will not drown proof a child of any age. It is critical that swim instructors stress this message as well as the need for constant supervision around water. Swim ability must be considered as only 1 part of water competence and a multilayered protection plan that involves effective pool barriers; close, constant, and attentive supervision; life jacket use; training in CPR and the use of an automated external defibrillator; and lifeguards. Children need to be taught never to swim alone and never to swim without adult supervision.

8. Parents should monitor their child's progress during swim lessons and continue their lessons at least until basic water competence is achieved. Basic swim skills include ability to enter the water, surface, turn around, propel oneself for at least 25 yards, float on or tread water, and exit the water.
9. Any time a young child visits a home or business where access to water exists (eg, pool, hot tub, open water), parents and/or guardians should carefully assess the premises to ensure that basic barriers are in place, such as sliding door locks and pool

fences with closed gates in good working order, and ensure that supervision will be consistent with the preceding recommendations.

10. All children and adolescents should be required to wear US Coast Guard–approved life jackets whenever they are in or on watercraft, and all adults should wear life jackets when boating to model safe behavior and to facilitate their ability to help their child in case of emergency. Small children and nonswimmers should wear life jackets when they are near water and when swimming. Parents and caregivers should ensure that any life jacket is approved by the US Coast Guard because many do not meet safety requirements. Information about fitting and choosing US Coast Guard–approved life jackets is available at the US Coast Guard Web site.<sup>47</sup> Parents should not use air-filled swimming aids (such as inflatable arm bands, neck rings, or “floaties”) in place of life jackets. These aids can deflate and are not designed to keep swimmers safe.
11. Jumping or diving into water can result in devastating spinal injury. Parents and children should know the depth of the

water and the location of underwater hazards before jumping or diving or permitting children to jump or dive. The first entry into any body of water should be feet first.

12. When selecting an open body of water in which their children will swim, parents should select sites with lifeguards and designated areas for swimming. 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 where there is a lifeguard, and if caught in a rip current, remain calm and either swim out of the rip current parallel to the shore (do not try to swim against the current) or tread water until safely out of the current and able to return to shore or signal for help.<sup>48</sup>
13. Parents and children should recognize drowning risks in cold seasons. Children should refrain from walking, skating, or riding on weak or thawing ice on any body of water.

### **Pediatricians**

1. Pediatricians should know the leading causes of drowning in their location so they can appropriately tailor their prevention guidance to caregivers. Pediatricians can provide specific targeted messages by age, sex, high risk of drowning, and geographical location.
2. Children with special health care needs should have tailored anticipatory guidance related to drowning risks. Children with epilepsy, ASD, and cardiac arrhythmias are at particular risk. When swimming or taking a bath, children of any age with epilepsy should be supervised closely by an adult at all times.<sup>15</sup> Children with

poorly controlled seizures should discuss water safety with their physician before swim activities.

3. Counseling parents and adolescents about water safety provides an opportunity to stress the problems related to alcohol and drug use during any activity. Specifically, the discussion should include a warning about the increased drowning risk that results when alcohol or illicit drugs are used when swimming or boating. Because male adolescents have high risk of water-based injuries, they warrant extra counseling.
4. Pediatricians should help facilitate a conversation between caregivers and their children about levels of water competency to decrease the frequency of children or parents overestimating swimming skills and equipping older children with the ability to make informed decisions when not in the presence of their parent or guardian.
5. Pediatricians should support the inclusion of CPR training in high school health classes.

### **COMMUNITY INTERVENTIONS AND ADVOCACY OPPORTUNITIES**

#### **Pediatricians**

1. Pediatricians should work with legislators and serve as a voice for children to pass policy that decreases the risk of drowning, including, but not limited to, policy on fencing, boating, life jackets, safety of aquatic environments, boating under the influence, and EMS systems. Pediatricians should partner with public health and policy leaders to address the issue of childhood drowning by implementing effective evidence-based interventions.
2. Pediatricians should use the term “nonfatal drowning” (rather than

“near drowning”) when speaking to families and the media to avoid confusion and misconceptions associated with the other terms previously used. There has been much misinformation circulated in recent years regarding dry drowning and secondary drowning.<sup>49</sup> Pediatricians should educate caregivers that dry and secondary drowning are not medically accurate terms. Pediatricians can address parental concerns by providing reassurance that nonfatal or fatal drownings do not occur at a later time in patients with no previous symptoms.

3. Pediatricians should partner with community groups to increase access to life jackets through life jacket-loaner programs at swimming and boating sites.
4. Pediatricians should work with community partners to provide access to programs that develop water-competency swim skills for all children, especially those from low-income and diverse families and those with developmental disabilities. Pediatricians can identify and support programs to increase the access to high-quality, culturally sensitive, and affordable programs.<sup>26</sup>

#### **Pool Operators**

1. Community pools should have certified lifeguards with current CPR certification.
2. Pool owners and operators should adopt the Model Aquatic Health Code to ensure that best practices are being used to keep the pool and spa environment safe.
3. Owners of private pools and spas and managers of public pools should be made aware of entrapment and/or entanglement risks and of the laws mandating drain covers and filter pump equipment needed to prevent these injuries that primarily involve children.<sup>50,51</sup>

## Policy Makers

1. Policy makers should pass legislation or building codes to mandate 4-sided isolation pool fencing for new and existing residential pools at the local and state level. Local governments should inspect and strictly enforce pool fencing requirements because this has been shown to be effective in reducing drowning.<sup>52</sup>
2. Policy makers should work with recreation and boating agencies to support legislation mandating that life jackets be worn by adolescents and by caregivers of children when boating.<sup>53</sup> When adults model appropriate behavior by wearing life jackets, children and adolescents are more likely to do so as well.<sup>53</sup>
3. States and communities should 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).<sup>54</sup>
4. States and communities should enforce laws that prohibit alcohol and other drug use by all watercraft occupants, not just operators.
5. State and local EMS personnel, medical examiners, health departments, and child-death-review teams should use consistent systematic reporting of information on the circumstances of drowning events. Periodic review of these data is critical in the development of drowning-prevention strategies appropriate for the geographic area.
6. Local governmental agencies should adopt the Model Aquatic Health Code for swimming pools, with better inspection and enforcement of swimming-pool safety standards.<sup>41</sup>

7. Because we lack a robust evidence base, a coordinated research agenda must be established to inform future policy, and federal funding should be secured to advance this research.

## APPENDIX: RESOURCES FOR PEDIATRICIANS AND FAMILIES

1. The American Academy of Pediatrics Web site (<http://www.aap.org>) contains educational materials for parents from the The Injury Prevention Program about home water hazards for young children, life jackets and life preservers, pool safety, and water safety for school-aged children. It also has links to water-safety information from the CPSC, the CDC, and Safe Kids Worldwide.
2. The Safe Kids Worldwide Web site<sup>55</sup> contains information about pools and hot tubs, drain covers and safety vacuum release systems to prevent entrapment, and safety checklists (in English and Spanish) about pools, spas, open-water swimming and boating, and home water safety. It also has links to a national research study about pool and spa safety. It has some nice materials for children, including boating-safety coloring pages. One can download a color water watcher badge from this site.
3. The CDC Web site (<http://www.cdc.gov>) contains a water-related injuries factsheet, 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. The CDC Childhood Injury Report contains state-specific information about drowning and other injuries.<sup>56</sup>
4. The CPSC Web site (<https://www.poolsafely.gov/>) has pool-safely materials for parents, grandparents, and caregivers, including supervision, fencing and

other barriers, drain covers, and CPR. It also includes information about the Virginia Graeme Baker Pool and Spa Safety Act and a list of manufacturers of approved drain covers and safety vacuum release systems. The publications section contains safety-barrier guidelines for home pools and a family education brochure about preventing childhood drowning. Specific information on fencing can be found online.<sup>46</sup>

5. The US Coast Guard Web site (<http://www.uscgboating.org/>) contains detailed information and tip sheets about life jackets, vessel safety checks, approved online boating-safety courses, and beach safety. It also has links to sites with information about safety and boating regulations as well as links to statistics, research, and surveys about boating and boating crashes and injury. Specific information on the right-fit life jacket can be found online.<sup>47</sup>
6. The American Heart Association Web site<sup>57</sup> contains information on CPR courses for the community and health professionals.
7. The National Autism Association Web site<sup>40</sup> contains many resources for families of children with ASD, including a Family Wandering Emergency Plan, MedicAlert tools, wireless window and door alarms, and many other helpful tools to keep children safe.
8. The Water Safety USA Web site (<https://www.watersafetyusa.org/>) contains information on water competency, water watchers, and water safety.

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prevention and policy and for her commitment to the American Academy of Pediatrics.

## ABBREVIATIONS

ASD: autism spectrum disorder  
CDC: Centers for Disease Control and Prevention  
CPR: cardiopulmonary resuscitation  
CPSC: Consumer Product Safety Commission  
EMS: emergency medical services

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