Centennial Edition

Swimming and Water Safety

USA DIVING

USA SWIMMING

American Red Cross

CHAPTER 2

Preventing Accidents and Injuries In, On and Around the Water

Aquatic environments and activities enrich our lives in countless ways. Enjoying a day at the beach, hosting a pool party for friends, or canoeing or kayaking on a local river are great ways to spend leisure time. But aquatic activities and environments can present special hazards. The key to having a good time *and* staying safe in and around the water is being aware of the potential hazards, and taking steps to prevent injuries or accidents as a result of them.

Lowering the Risk for Drowning

In the United States, drowning ranks fifth among the causes of death from unintentional injury. And, even when a drowning incident does not result in death, it can result in significant long-term disability. Drowning happens quickly and suddenly. Lowering the risk for drowning requires following general principles of water safety **(Box 2-1)** and establishing layers of protection **(Fig. 2-1)**. Having layers of protection in place provides "backup" if one protective strategy fails, reducing overall risk. The American Red Cross has established five layers of protection for lowering the risk for drowning:

- Learn swimming and water safety survival skills.
- Swim in lifeguarded areas.
- Have children, inexperienced swimmers and boaters wear U.S. Coast Guard-approved life jackets.
- Provide close and constant supervision to children who are in or near the water.
- Fence pools and spas with adequate barriers to prevent unsupervised access.

Age is a major risk factor for drowning incidents. In the United States, drowning ranks second, behind motor vehicle crashes, as a cause of death from unintentional injury in children ages 1–14. Children between the ages of 1 and 4 years have the highest rate for drowning. Most of these incidents occur in home swimming pools, but any source of water, including a bathtub or partially filled bucket, is a potential drowning hazard. An infant can drown in as little as 1 inch of water. **Box 2-2** contains tips for lowering the risk for drowning for children.

Box 2-1

General Guidelines for Staying Safe Around the Water

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- Learn to swim.
- Do not use alcohol or drugs while engaging in aquatic activities.
- Obtain the knowledge and skills you need to prevent, recognize and respond to aquatic emergencies (for example, by taking a boating safety course before operating any watercraft).
- Never swim alone. Swim only in designated areas and areas supervised by a lifeguard.
- Set up specific swimming rules for each member of your family or group based on swimming abilities. Closely supervise children in, on or around the water, even when a lifeguard is present.
- Read and obey all rules and posted signs. Pay special attention to water-depth markings and "no diving" signs.
- Enter the water feet-first, unless you are in an area that is clearly marked for diving and has no obstructions.
- Watch out for the "dangerous too's": too tired, too cold, too far from safety, too much sun and too much strenuous activity.
- Have a means of summoning help (such as a mobile phone) close by. Aquatic emergencies often happen quickly and unexpectedly.
- Get trained in first aid, cardiopulmonary resuscitation (CPR) and automated external defibrillator (AED) use. To enroll in a Red Cross first aid, CPR and AED class, visit www.redcross.org.

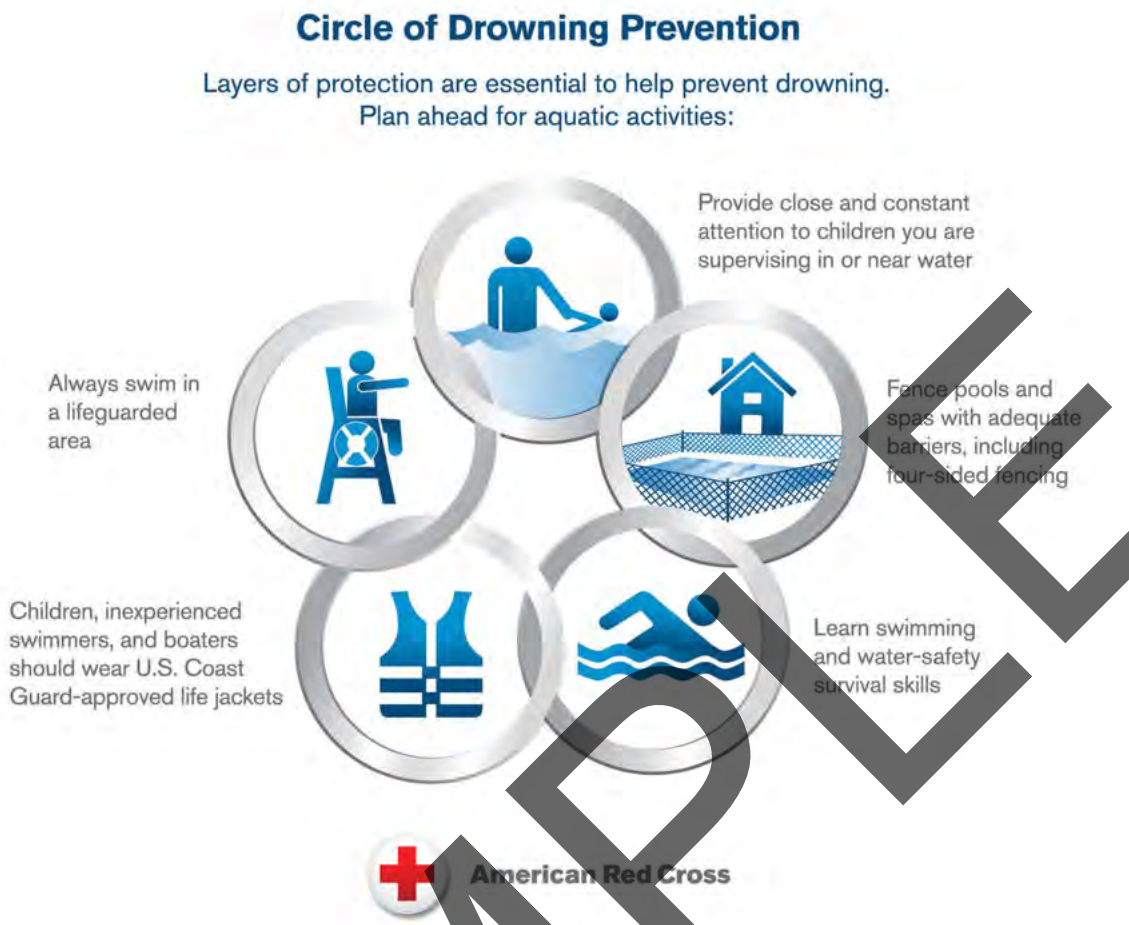

Fig. 2-1 The American Red Cross Circle of Drowning Prevention highlights the layers of protection that help to lower the risk for drowning.

Box 2-2

Tips for Reducing the Risk for Drowning in Children

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- Enroll children in Red Cross Parent and Child Aquatics, Preschool Aquatics and Learn-to-Swim courses. Providing early aquatic experiences to a child is a gift that will have lifelong rewards.
- Young children are curious and their interests and abilities change from day to day. Do not leave a young child unattended near any source of water, even for a moment.
- Closely supervise children in, on or around the water, even when a lifeguard is present, no matter how well the child can swim or how shallow the water. Stay within an arm's reach of any weak or inexperienced swimmer who is in the water.
- Know each child's swimming ability and set specific rules for each child based on her swimming ability.

Box 2-2 *(continued)*

- Do not rely on the use of water wings, swim rings, inflatable toys and other items designed for water recreation to replace a U.S. Coast Guard-approved life jacket or adult supervision. These devices can suddenly shift position, lose air or slip out from underneath the child, putting the child at risk for drowning. They may also falsely increase a child's sense of confidence, causing him to venture into water that is too deep.
- Teach children not to engage in competitive underwater games, such as seeing who can hold his or her breath the longest underwater or seeing who can swim the farthest before coming up for air. Hyperventilation (that is, taking a series of rapid, deep breaths before submerging in an effort to hold the breath longer underwater) affects the body's drive to breathe. The child could pass out and then instinctively take a breath underwater, leading to drowning.
- Teach children to stay away from pool drains and other openings that create suction. The suction can hold the child underwater, leading to drowning.
- Prevent access to standing water in the home. Empty bathtubs, sinks, kiddie pools, buckets and other containers immediately after use. Keep toilet lids down and bathroom and laundry room doors closed and secured with safety locks.
- Never leave a child in a bathtub alone; always stay within arm's reach. Do not rely on bathtub floating aids to protect your child from drowning.
- If you own an inground swimming pool, aboveground swimming pool (including inflatable "easy-set"-type pools) or hot tub:
  - Surround the entire pool or hot tub area with a fence that is at least 4 feet high, has a self-closing and self-latching gate, and is designed so that a child cannot climb over, under or through it.
  - Be sure that all gates, windows and doors leading to the pool or hot tub area are locked.
  - Make sure that pools and hot tubs are covered when not in use, and that the cover is secured.
  - Keep pool toys out of the water and out of sight. (A child may see a pool toy floating in the water and try to go after it.)
  - To prevent the child from climbing over a fence and getting into the pool or hot tub area, keep chairs, tables and other items the child could climb on away from the pool or hot tub enclosure.
  - If a child is missing, always look in the pool area first. Seconds count in preventing death or disability.
- If there are bodies of water, fountains or other water features on or near your property or in the community, teach children that these areas are off-limits unless they are accompanied by an adult.
- When visiting another home, check the site for potential water hazards and always supervise your children.
- Never let a child play near storm drains. (Storm drains are especially dangerous after it has rained.)

School-age children often have the opportunity to attend day trips to aquatic facilities that are organized and hosted by a school or community group. In addition, many parents enroll their school-age children in summer camps, where water activities may be a major attraction. In these situations, parents may not be present to directly supervise their children, so it is important for parents to evaluate the host organization's attention to, and provisions for, aquatic safety **(Box 2-3)**.

While pools are a source of danger for younger children, a large number of drowning accidents involving older children, teens and young adults take place in natural bodies of water. The percentage of drowning incidents in natural bodies of water increases with age, with more than half of all the victims in these incidents being 15 years of age and older. Nearly every community has some type of natural body of water, such as a canal, pond, creek, stream, river, lake, drainage basin, reservoir, wetlands area or shoreline that can be accessed easily. In many communities, these areas are frequently features of public parks. Easy access to natural water environments, combined with the growing independence of older children and adolescents, can make these environments especially dangerous to children who are old enough to explore on

Box 2-3

Promoting Safety During Children's Group Aquatic Outings and at Summer Camps

Group outings

Planning and preparation are essential when organized groups attend a day trip to an aquatic environment. Parents can ask the following questions of the group's organizers to evaluate the measures that have been put in place to help keep their children safe during the outing:

- May I have a copy of the written safety plan? (Group organizers should prepare a written safety plan that identifies the safety measures that will be taken and the provisions for appropriate supervision that will be made for maintaining safety during the planned aquatic outing.)
- Will the group be allowed to swim only in designated areas supervised by a certified lifeguard?
- What is the adult chaperone-to-child ratio? (Lifeguards should not be counted as part of this ratio.)
- What activities are planned, and will they be supervised by appropriately trained personnel?
- What system will be used to evaluate each child's swimming ability? Is a system in place for easily identifying each child's swimming ability, such as color-coded tags or caps?
- Are criteria in place (such as height and weight requirements) for attractions such as water slides? How will children be prevented from participating in activities or going on attractions that are beyond their skill level or are otherwise unsafe for them?
- Is there a system (such as roll calls or buddy checks) in place to ensure that staff can quickly account for all children in the group at all times?
- What training and certifications must facility staff (such as lifeguards) have? Do adult chaperones who will be attending the trip know how to swim, and are they trained in water safety and CPR?

Summer camps

Similar information should be sought before enrolling a child in a summer camp. First, make sure the camp meets the government's standards for aquatic safety. Government safety standards for swimming at camps may be covered in state bathing codes or they may be found in separate regulations specific for day and residential camp programs. Because codes vary from state to state, also check to see if the camp follows the aquatic safety standards established by national organizations such as the American Camp Association (ACA), the Boy Scouts of America or the YMCA of the USA. Finally, use the following questions to evaluate the camp's attention to, and provisions for, aquatic safety:

- What is the condition of the pool, waterfront or any other aquatic features? Is the staff properly trained and qualified to supervise and teach aquatic activities?
- What are the aquatic activity areas like? Are they well-designed and maintained, free of obvious hazards and closely supervised by adequate numbers of alert, trained staff? What is the condition of any equipment being used?

Box 2-3 *(continued)*

- Does the camp use a system for easily identifying a camper's swimming ability, such as color-coded tags or caps?
- Are campers classified by their swimming ability? Are instructional and recreational activities consistent with the campers' abilities?
- Is there a system (such as roll calls, buddy checks or buddy tags) in place to ensure that staff can quickly account for all campers at all times?
- Does the camp have a system for promptly accessing emergency personnel and facilities?
- Does the camp require additional information about any temporary or chronic medical condition that might require special precautions in, on or around the water?

Fig. 2-2 Natural bodies of water in the community can be enticing to older children and teens who are old enough to explore on their own. Accidents can happen when children and teens do not know, or fail to appreciate, how dangerous these areas can be.

their own **(Fig. 2-2)**. For this reason, it is important to teach older children and teens about the dangers natural bodies of water in the community present, and to make and enforce rules related to visiting these areas. Also, be aware that aquatic emergencies do not always happen when people are swimming. A hike along a mountain stream or a canoe-camping trip poses just as much risk for an aquatic emergency to develop.

Using Life Jackets

Life jackets, also known as personal flotation devices (PFDs), are not just for boaters. Young children, weak or inexperienced swimmers and nonswimmers should also wear life jackets whenever they are in, on or around the water.

Life jackets are available in many styles and for many different activities. The U.S. Coast Guard has categorized PFDs into five types according to their buoyancy and purpose **(Table 2-1)**.

Table 2-1 Personal Flotation Devices

Type	Description	Advantages	Disadvantages
I: Life jacket 	• Intended for boating on open, rough or remote waters where rescue may be slowed or delayed • May help to turn an unconscious person from a face-down position to a vertical, face-up position or to a face-up slightly tipped back position	• Offers the most reliable flotation • Comes in highly visible colors and may have reflective markings to aid search and rescue	• Bulky in and out of the water
II: Buoyant vest 	• Intended for recreational boating on calm or inland waters where rapid rescue is likely • Suitable for supervised use in pools and waterparks • May help to turn an unconscious person from a face-down position to a vertical, face-up position or to a face-up slightly tipped back position	• More comfortable to wear • Available for infants through adults; good choice for children	• Not recommended for long hours on rough water • Less buoyant than a type I life jacket
III: Flotation vest 	• Intended for fishing or sailing on calm or inland waters where rapid rescue is likely • Suitable for supervised use in pools and waterparks • May help to keep a conscious person in a vertical, face-up position or in a face-up slightly tipped back position; wearer may have to tilt the head back to avoid going face-down	• Most comfortable to wear continuously • Available in many styles • Appropriate for boating and specified water activities	• Must be water-tested by inexperienced swimmers before boating • Wearer may need to tilt head back to avoid turning face-down in the water
IV: Throwable device 	• Intended to be thrown to a person in the water; not to be worn • Not intended to take the place of a wearable life jacket	• Able to be thrown from boat or land • Backup to wearable life jackets • Possible use as seat cushions (some styles)	• Not suitable for children, inexperienced swimmers or unconscious victims
V: Special-use device 	• Intended for specific activities such as whitewater rafting • May be worn instead of another life jacket only if used according to the approval condition(s) on its label • Worn continuously	• Designed for specific activities • Continuous wear provides continuous protection	• Limited use

Types I, II, III and V are referred to as life jackets because they are worn on the body, whereas type IV is a throwable device. When choosing a life jacket, select one that has been approved by the U.S. Coast Guard. PFDs that have been approved by the U.S. Coast Guard will have an approval label stamped directly on the device **(Fig. 2-3)**. In addition, consider swimming ability, the planned activity and the water conditions. Type II and type III life jackets are most often used in pool, waterpark and waterfront settings.

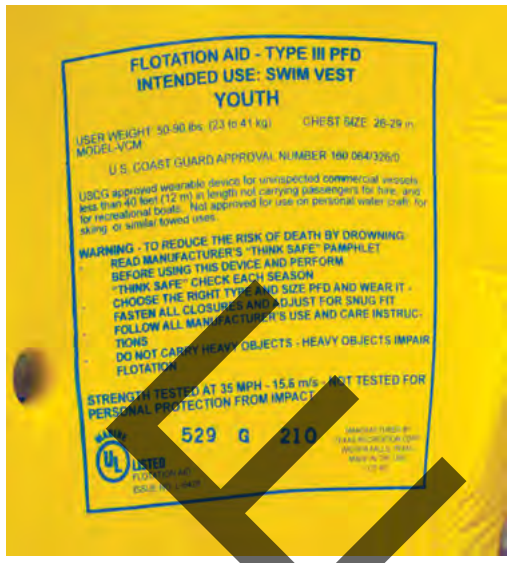


Fig. 2-3 Only use U.S. Coast Guard-approved personal flotation devices (PFDs, or life jackets).

Before using a life jacket, make sure that it fits properly. Life jackets are sized according to weight. A properly fitted life jacket feels comfortably snug. Also check to make sure that it is in good condition. Check any buckles or straps to make sure that they function properly and look closely for any rips, tears or holes. Discard any life jacket with torn fabric or straps that have pulled loose. Test the life jacket in shallow water and see how it feels. Practice swimming with it. Then relax and let your head tilt back. Notice if the device can keep your chin above water, allowing you to breathe easily. The life jacket should not ride up on your body in the water.

Water wings and items designed for water recreation (such as inner tubes and inflatable rafts) are not designed or tested for safety and cannot be used as a substitute for a U.S. Coast Guard-approved life jacket and adult supervision **(Fig. 2-4)**. In fact, these pool toys may actually increase a nonswimmer's or an inexperienced swimmer's risk for getting into a dangerous situation in the water, by giving the swimmer a false sense of security. For example, the swimmer may move into water that is too deep, fall off the toy and into the water, or the toy may overturn, setting up the potential for a drowning situation.

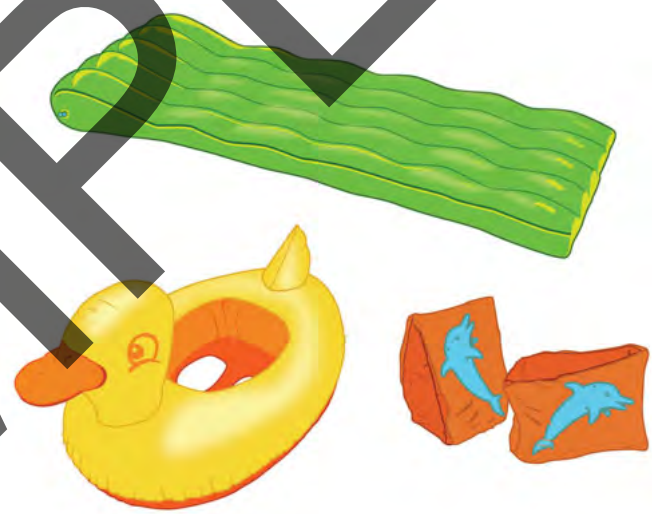


Fig. 2-4 These items are just toys. Do not count on them to provide flotation or to keep a nonswimmer or inexperienced swimmer safe in the water.

Staying Safe from Environmental Hazards

Many aquatic activities provide a great opportunity to get outside and enjoy fresh air and sunshine. Make sure your experience stays enjoyable by being aware of environmental hazards and taking steps to protect yourself from them.

Sun Overexposure

Overexposure to the sun has been linked to multiple health problems, including painful sunburns, skin cancer and eye damage (such as cataracts), and can cause premature aging and wrinkling of the skin. Everyone, regardless of age or skin color, is advised to take steps to limit overexposure to the sun, such as wearing protective clothing, seeking shade when the sun's rays are strongest and consistently using a broad-spectrum sunscreen.

Energy from the sun is called solar radiation. Solar radiation reaches the Earth in a range of wavelengths or rays. Some of these rays are blocked by the atmosphere, but ultraviolet A (UVA) and ultraviolet B (UVB) rays are able to penetrate the atmosphere and reach the Earth's surface. In the past, the ozone layer of the atmosphere offered more protection from dangerous UV rays, but this layer is becoming depleted, permitting greater amounts of UV radiation to reach the Earth's surface. Worldwide efforts are being made to stop the production of chemicals that have contributed to thinning of the ozone layer. The current belief is that with full compliance with these efforts, the ozone layer can return to normal levels by 2050. However, people living and growing up during this timeframe will live most of their lives with increased levels of UV radiation. It is overexposure to UVA and UVB rays that can lead to skin cancer and other health problems.

Skin cancer is the most common type of cancer in the United States, and it is reaching epidemic proportions. According to the American Academy of Dermatology, current estimates are that one in five Americans will develop skin cancer. Despite these statistics, skin cancer is one of the most preventable types of cancer. Of the different types of skin cancer, melanoma is the most serious and also one of the fastest growing types of cancer in the United States. The major risk factor for melanoma is exposure to UV light, and dermatologists think that sunburns experienced in childhood may lead to melanomas later in life. Non-melanoma skin cancers, including basal cell carcinomas and squamous cell carcinomas, are less deadly than melanomas but can be disfiguring and cause more serious health problems if left untreated.

One of the most important actions you can take to reduce your risk for health problems as a result of sun overexposure is to use sunscreen regularly and properly **(Fig. 2-5)**. Choose a sunscreen labeled "broad-spectrum" (this means it will provide protection against both UVA and UVB rays) that has a sun protection factor (SPF) of at least 30. Apply the recommended amount of sunscreen to all exposed skin at least 15 minutes before you go outside, even if it is cloudy out (it is still possible to burn on a cloudy day). Be sure to remember commonly missed areas, such as the lips, ears and the tops of the feet. Reapply sunscreen every 2 hours and after swimming or sweating. Use sunscreen every day, even if you are not going to be outside for long. The sun's rays can also damage your skin through the windows of a car or building. **Box 2-4** summarizes the actions you can take to protect yourself and your family from sun overexposure.

Fig. 2-5 Proper and consistent use of a broad-spectrum sunscreen with a sun protection factor (SPF) of at least 30 can help protect you from the harmful effects of sun overexposure.

Box 2-4

Safe Fun in the Sun

- Use sunscreen regularly and properly. Generously apply a broad-spectrum sunscreen with a sun protection factor (SPF) of at least 30 in ample amounts to all exposed skin 15 minutes before going outdoors, even on cloudy days and even if you do not intend to be outdoors for long. Reapply every 2 hours and after swimming or sweating.

Box 2-4 *(continued)*

- Be aware that sunscreen is not recommended for babies younger than 6 months. If a baby younger than 6 months is outside, it is best to protect the baby from the sun by making sure she is dressed in adequate clothing and by keeping her in the shade (for example, underneath an umbrella or the canopy of a stroller). If you do choose to apply sunscreen to a baby younger than 6 months, apply only a small amount to the baby's face and the back of her hands.
- Wear protective clothing, such as a wide-brimmed hat and sunglasses, when possible. Choose sunglasses that offer 99–100% protection against UV rays. If the temperature is not too warm, long-sleeved shirts and pants can offer some protection from the sun too.
- Pay attention to the UV Index to help you plan your outdoor activities in ways that prevent overexposure to the sun. The National Weather Service calculates the UV Index daily for most zip codes across the United States, predicting the level of solar radiation expected and the risk of possible overexposure, using a scale from 0 to 11+. A UV Index of 0 to 2 indicates a low risk whereas a UV Index of 8 or higher indicates a very high risk.
- Pay attention to the time of day. The sun's rays are strongest between 10 a.m. and 4 p.m. During these hours, avoid exposure to the sun or seek shade, if possible. Follow the Shadow Rule: *Watch Your Shadow. No Shadow, Seek Shade!*
- Know that water, sand and snow reflect the sun's rays, increasing exposure and the risk for sunburn.
- Avoid suntanning and tanning beds. If you want to look like you have been in the sun, use a self-tanning product. Be aware that self-tanning products do not offer protection from the sun so you will also need to use sunscreen.
- Eat foods high in Vitamin D rather than using the sun to get this vitamin.
- Early detection of skin cancer can save your life. Visit a dermatologist for an annual skin exam, and examine all of your skin yourself once a month. Have any new or changing moles evaluated by a dermatologist.

Heat-related Illnesses

Heat-related illnesses can occur on hot, humid days when the body is not able to effectively cool itself through sweating. As a result, the body temperature rises and serious illness can result.

Although it might seem hard to believe that you can overheat while in the water, it can and does happen. Heat-related illnesses occur when fluid is lost during heavy sweating and is not replaced. Just because you are in the water does not mean that you are not sweating, particularly if you are playing or exercising! Working hard or exercising in the heat also increases a person's risk for developing a heat-related illness. And sometimes, just being out in the heat and humidity for a long period of time can be a problem.

Fig. 2-6 Staying hydrated is an important way to ward off heat-related illnesses. *Image © Maridav, 2014. Used under license from Shutterstock.com*

The best prevention strategy for heat-related illnesses is to stay properly hydrated **(Fig. 2-6)**. Staying hydrated helps to make sure the fluids lost from sweating are replaced, which keeps fluid levels in the body balanced and gives body tissues what they need to function well. Water is the best choice of fluid for staying hydrated, but commercial sports drinks, fruit juices or milk are also acceptable. Drink a few ounces every 15–20 minutes or however much you need to not feel thirsty. The feeling of thirst means that the body is already dehydrated. Avoid gulping down fluids quickly. Small amounts taken in slowly work best.

There are three types of heat-related illnesses, of increasing severity:

- **Heat cramps** are painful muscle spasms, usually in the legs and stomach. Heat cramps can quickly turn into heat exhaustion or heat stroke.
- **Heat exhaustion** occurs when the body's cooling system is not able to keep up. The person's skin may be cool and moist, and either very pale or gray, or red. The person may be sweating heavily and may complain of a headache, nausea or dizziness. The person may feel very weak or exhausted.
- **Heat stroke** is the most severe form of heat-related illness. It occurs when the body's cooling system is completely overwhelmed and stops functioning properly. Heat stroke is life threatening! The person's skin will be red and hot, and it may be moist or dry. The person may seem confused, have changes in consciousness or lose consciousness. Breathing may be rapid and shallow, and the pulse may be rapid and weak. The person may vomit.

When a heat-related illness is recognized in its early stages, it usually can be reversed. Move the person to a cooler environment with circulating air. Loosen or remove as much clothing as possible; apply cool, wet cloths and fan the person. If the person is conscious and able to swallow, give small amounts of a cool fluid such as a commercial sports drink, fruit juice, milk or water. If the person's condition does not improve or you suspect heat stroke, call 9-1-1 or the local emergency number immediately. If the person becomes unconscious, be prepared to give CPR.

Hypothermia

In hypothermia, the body is not able to keep itself warm and the body temperature falls far below normal. Hypothermia can lead to death if it is not treated. In an aquatic setting, hypothermia can result from exposure to cold water or air temperatures, or both. The air or water temperature does not have to be below freezing for hypothermia to occur. This is especially true if a person is wet and there is wind. For example, a child who is wet from swimming could develop hypothermia, even in the summertime!

Children and older adults are particularly susceptible to hypothermia. Environmental conditions and prolonged exposure to water or wet clothing (which speeds up the rate at which body heat is lost) can also increase susceptibility to developing hypothermia—even during the summer or in indoor facilities. Immersion in cold water (for example, as a result of breaking through ice, falling off a pier or being thrown into the water from a boat) also puts a person at risk for hypothermia. **Box 2-5** summarizes actions you can take to lower the risk for developing hypothermia when engaging in aquatic activities.

Box 2-5

Lowering the Risk for Hypothermia

- Avoid being outdoors during the coldest part of the day.
- Be aware that many people who fall into cold water never intended to go into the water in the first place. Whenever you are near cold water (for example, playing, working, hunting or fishing), remember that cold water can be dangerous, and take the appropriate precautions.
    - In cooler weather, wear an outer layer that is water-resistant and breathable, a warm hat, and lightweight layers of clothes or insulated clothes.
    - Avoid cotton, which traps moisture. Instead, wear wool or synthetic blends, which help to move moisture away from the skin.

Box 2-5 *(continued)*

- Know that clothing can help you float and stay warm if you fall into the water (see Chapter 3).
- If you are in a remote area, carry matches in a waterproof container. It may be necessary to build a fire to warm up after a fall into cold water.

- Always wear a U.S. Coast Guard-approved life jacket while boating in cold water.
- Wear a wet suit for skin diving, surfing and kayaking, or other activities that take place in the open water or involve repeated submersion.
- Only participate in aquatic activities when and where it is possible to get help quickly in an emergency.
- Drink warm fluids that do not contain alcohol or caffeine to help the body maintain a normal temperature. Although alcohol may temporarily make you feel warmer, it actually increases loss of body heat and susceptibility to hypothermia.

When a person falls into cold water (for example, as a result of falling through ice), the temperature in the person's arms and legs drops very quickly, due to heat loss through the blood circulating near the skin. The person may have trouble breathing and then may slowly become unable to use the arms and legs. As the person's core temperature continues to drop, function of the heart, brain and other vital organs is affected. The person may become unable to think clearly and lose consciousness. Death from heart failure is possible, but drowning may occur first. In emergencies that involve immersion in cold water, make sure 9-1-1 or the local emergency number has been called and be prepared to give CPR.

Inclement Weather

Weather conditions can change suddenly. Always check the weather forecast before heading out, and know what to do in case inclement weather suddenly arises. You can learn about different kinds of weather events, and how to be prepared for them, by visiting the American Red Cross website (www.redcross.org).

Fig. 2-7 If you are in or around water and you hear thunder or see lightning, remember the 30/30 rule: take cover when the time between a flash of lightning and a roll of thunder is 30 seconds or less, and remain under cover until 30 minutes after the last flash of lightning was seen or the last roll of thunder was heard. *© iStockphoto.com/Molnár ákos*

Thunderstorms

Electricity and water do not mix! Leave the water at the first sound of thunder or sight of lightning **(Fig. 2-7)**. Remember the 30/30 rule: take cover when the time between a flash of lightning and a roll of thunder is 30 seconds or less, and remain under cover until 30 minutes after the last flash of lightning was seen or the last roll of thunder was heard. If you are outside and cannot reach safety inside of a building, look for a low area. Avoid high ground, tall trees that stand alone, and structures such as sheds, dugouts, bleachers and picnic pavilions. These areas are not safe in a thunderstorm. If no safe shelter is available, squat with your feet together and your arms wrapped around your legs. You want to stay low, but you do not want to lie flat. The less of your body that is in contact with the ground, the better.

Floods

Floods are among the most common water hazards that occur in the United States. Anywhere it rains, it can flood. Being aware of local flood hazards is important for everyone, but especially for

people who live near water, in low-lying areas, behind a levee or downstream from a dam. Flooding occurs when waterways such as rivers or streams overflow their banks. It can also occur when rainfall or snow melt exceeds the capacity of underground pipes or drains designed to carry floodwater away from urban areas. Some floods build gradually over a period of days, but flash floods can develop within minutes or hours without any obvious signs of rain. They often produce powerful and destructive walls of water and debris.

Fig. 2-8 Floodwaters are extremely dangerous. Never try to drive or walk through them. *Image © Hank Shiffman, 2014. Used under license from Shutterstock.com*

When a flood watch or warning is in effect, head to higher ground and stay away from the water **(Fig. 2-8)**. If emergency officials advise evacuation, do so immediately. Remember the motto, "*Turn around, don't drown!*" According to the National Weather Service, most of the fatalities during flood events result from people attempting to drive or walk on flooded roadways. It only takes 18 inches of water to lift a vehicle. Once a vehicle becomes buoyant, the water will easily push it sideways and could cause it to tip over. If you are trapped in a car on a flooded road, abandon the car immediately and move to higher ground. Use extreme caution when walking through floodwaters. Six inches of swiftly moving floodwater is enough to knock you off your feet.

Avoid natural bodies of water for 24 hours after heavy rains and flooding, because runoff can contaminate the water with toxic substances. Pay particular attention to children. They are curious and lack judgment about flood-related hazards, such as swiftly moving water and contaminated water.

Recreational Water Illnesses

A **recreational water illness (RWI)** is an illness that is spread by swallowing, breathing or contacting contaminated water. A person can contract an RWI from a natural body of water or from the chlorinated water found in pools and waterpark attractions. In fact, pool water is a very common source of RWIs, especially common ones such as diarrhea, earaches and rashes. In rare cases, RWIs can cause pneumonia, neurological damage and even death.

In a swimming pool or waterpark setting, water contaminated by feces is a primary source of RWIs. Vomit and blood are less likely to cause RWIs. Look for clues to water quality before you get in the water—the pool water should be clean and clear with little or no odor. You should be able to clearly see the main drain on the bottom of the pool, and there should not be a strong chemical odor in the air. Visually inspect surfaces. Pool tiles and attractions such as waterslides should not be sticky or slimy. Lastly, ask the facility staff about the facility's protocols for maintaining water quality, conducting health inspections and training staff members about water quality.

You may also be able to obtain information about water quality in some natural settings, such as at the ocean or lake. Many guarded beaches are tested regularly for pollution and disease-causing organisms. In some areas, water quality flags give information about water conditions. For example, blue flags indicate good swimming conditions and red flags indicate a potential water quality problem.

Diarrhea

Diarrhea is the most commonly reported RWI. When a person with diarrhea swims, the water becomes contaminated. A person who swallows the contaminated water could also then become ill. To lower the risk of infection for others, a person who has diarrhea should not enter

Box 2-6

Six "PLEAs" for Healthy Swimming: Limiting the Spread of RWIs

1. **PLEASE** do not swim when you have diarrhea. This is especially important for children in diapers.
2. **PLEASE** avoid getting pool water in your mouth, or swallowing it.
3. **PLEASE** practice good hygiene.
   - Shower with soap before swimming.
   - Wash your hands after using the toilet or changing diapers.
4. **PLEASE** take your children on bathroom breaks and check diapers often.
5. **PLEASE** change diapers in a bathroom or a diaper-changing area, not at poolside.
6. **PLEASE** wash your children thoroughly (especially the buttocks area) with soap and water before swimming.

Adapted from Centers for Disease Control and Prevention: Six Steps for Healthy Swimming. (http://www.cdc.gov/healthyswimming/)

the water. The Centers for Disease Control and Prevention (CDC) has developed six "PLEAs" to promote safe and healthy swimming in pools and at waterparks **(Box 2-6)**.

When a young child who still wears diapers will be in the water, many facilities require that the child wear swim diapers **(Fig. 2-9)**. Swim diapers are specifically designed to be worn in the water. They are water-resistant and fit snugly around the child's waist and legs. However, if a child has a bowel movement in the diaper, there is still risk for stool escaping and contaminating the water. For this reason, it is important to take frequent breaks to check and change the diaper.

Fig. 2-9 Many facilities require children who wear diapers to wear swim diapers when they are in the pool.

A contamination incident involving feces or vomit that contains solid matter or food particles requires staff to implement decontamination procedures. These procedures include evacuating the pool, removing any solid matter, increasing the chlorine level and maintaining the elevated chlorine level for a set period of time before reducing the chlorine level to its normal level and reopening the pool. For an incident that involves vomit or formed stool, the pool must remain closed for 25 minutes. For an incident that involves diarrhea, the pool must remain closed for 13 hours.

Swimmer's Ear

Swimmer's ear, an RWI that most often affects children, occurs when water remains in the external ear canal for a prolonged period of time. The water usually is contaminated by organisms found in pools and other water environments. The trapped water allows these organisms to grow in the ear canal, causing irritation and infection. Signals of swimmer's ear typically begin within a few days of swimming and may go away on their own without treatment. However, a painful, swollen or full feeling in the ear or even slight hearing loss are reasons to see a health care provider. These signals could indicate a more serious inner ear infection. **Box 2-7** contains tips for preventing swimmer's ear.

Box 2-7

Tips for Preventing Swimmer's Ear

- Wear a swim cap or wetsuit hood, especially for activities that involve frequent submersions (such as surfing).
- Use silicone earplugs. Avoid wax earplugs because these can damage the ear canal and make infection more likely. Do not use any earplugs when surface diving.
- Keep the lining of your ear canals healthy. Do not insert objects (such as cotton swabs or a finger) into the ear canal, because doing so can remove protective earwax and scratch the lining of the ear canal, making infection more likely.
- Remove water from the ears after swimming.
  - Tilt your head to one side (so that one ear is facing down) and jump energetically several times to allow water to escape from your ear. Gently pulling the earlobe in different directions while the ear is facing down may also help the water escape.
  - Use a hair dryer on the low setting: gently pull down the ear lobe and blow warm air into the ear from several inches away.
- Use over-the-counter eardrops that contain one or more agents to evaporate any water, kill the organisms and moisturize the ear canal before and after swimming. Ask your health care provider for recommendations.
- Dry ears thoroughly after swimming by using a towel to gently wipe the outer ear. Do not insert anything (such as a cotton swab) into the ear canal in an attempt to dry it.
- Children who have ear tubes should only participate in aquatic activities that have been approved by their health care providers.

Staying Safe in Specific Aquatic Environments

Throughout the course of a lifetime, a person may have the opportunity to engage in and enjoy aquatic activities in a variety of settings. Every aquatic setting poses specific safety challenges. Being aware of these safety challenges can help you stay safe no matter what aquatic setting you are in.

Swimming Pools and Hot Tubs

Swimming pools and hot tubs may be open to the public or privately owned by homeowners. Public pools and hot tubs include those found in recreation and fitness centers, hotels and motels, and multi-unit housing complexes. Some public pools and hot tubs are supervised by lifeguards and others are not. **Box 2-8** summarizes important tips for staying safe for anyone visiting a public pool or hot tub.

Box 2-8

Safety Tips for Patrons of Public Pools and Hot Tubs

- Read and obey all rules and posted signs. Pay special attention to water-depth markings and "no diving" signs.
- Obey the lifeguard's instructions at all times.
- Supervise members of your own party while they are in the water, especially children, even when a lifeguard is on duty. Take breaks from water activities to give both the swimmers and those supervising them an opportunity to rest.

Box 2-8 *(continued)*

- Note the location of safety equipment (such as a reaching pole and ring buoy). Remind children not to play with the safety equipment.
- Do not swim in a pool that is overly crowded or with swimmers who are not following the rules.
- Check to see that the pool or hot tub and facility are well-maintained. Reconsider patronizing the facility if there are obvious hazards (such as cracks in the deck, malfunctioning equipment or cloudy water).

Home (residential) swimming pools and hot tubs are an attractive feature for many homeowners **(Fig. 2-10)**. They create a beautiful environment that offers years of fun and activity for families. However, pool or hot tub ownership carries with it the responsibility for ensuring that the pool or hot tub is safe and well maintained.

Fig. 2-10 A pool can be a lovely addition to the landscape and a great place for relaxing and entertaining, but it can also be a safety hazard if the proper precautions are not taken.
Photo: Life Saver Pool Fence Systems, Inc.

Preventing Unsupervised Access to the Pool or Hot Tub Area

Home swimming pools (including inground pools, aboveground pools and "easy-set" inflatable pools) and hot tubs pose a significant threat to young children living in the home, as well to other children in the neighborhood. Most drowning incidents involving children between the ages of 1 and 4 years take place in home swimming pools. Many of these incidents happen very suddenly—about 5 minutes or less after the child goes missing—and while the parents are at home. Homeowners with pools or hot tubs need to take a multi-tiered approach to securing the pool area and minimizing the likelihood that a child will gain unsupervised entry:

- Enclose the pool area on all four sides using an appropriate barrier system **(Box 2-9),** and then make sure the barrier remains secure. Always make sure gates are latched and keep items away from the barrier (such as lawn furniture) that a child could use to climb up and over into the pool area.
- Install pool alarms. These alarms use sensors to detect motion in the water. Underwater pool alarms generally perform better and can be used in conjunction with pool covers. Use remote alarm receivers so that the alarm can be heard inside the house or in other places away from the pool area.

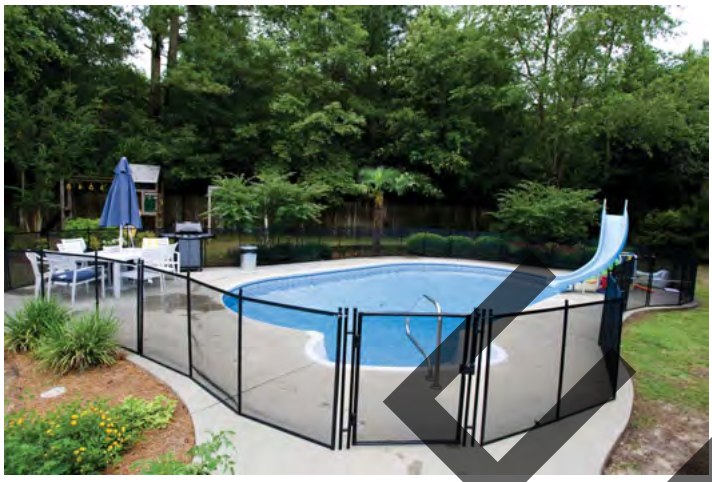
Safety Barrier Guidelines for Home Pools (Pub. No. 362), a resource containing guidelines for choosing and installing fences, gates, covers and audible alarms to prevent unsupervised access to residential swimming pools and hot tubs, is available at no charge from the Consumer Product Safety Commission (CPSC) website (www.cpsc.gov). It is a good idea to check the CPSC site periodically for updated recommendations. Also, be aware that local building codes, regulations and statutes for pools and hot tubs differ from state to state. Many states have pool fence laws. Check with local authorities to find out specific building codes and owner responsibilities.

Preventing Drain Entrapment

Drain entrapment can occur when a pool or hot tub drain is uncovered, or the drain cover is broken or not secured properly. Suction pulls hair, clothing, jewelry, or a body part into or against

Box 2-9

Guidelines for Securing the Pool Area



- Pool fence gates should be self-closing and self-latching and open outward, away from the pool. The latch should be out of a small child's reach.
- Pool barriers should be at least 4 feet high and enclose the entire pool area. They should not have any features that could be used as a hand- or foothold. Solid barriers should not have any features other than normal construction joinery.
- For most fence designs, spacing between vertical members should not exceed 1¾ inches. The opening on chain link fences should not exceed 1¼ inches.
- Horizontal fence support structures that are less than 45 inches apart should be on the pool side of the fence. On fences with horizontal support structures that are greater than 45 inches apart, the horizontal support structures can be on either side of the fence.
- The space under a pool barrier should not exceed 4 inches.
- Any openings in the barrier should not allow a 4-inch sphere to pass through.
- Aboveground pools (including inflatable "easy-set"-type pools) should have a barrier mounted on top of the pool structure that encloses the entire pool. Steps or ladders to the pool should be removable or enclosed by a locked barrier, so that the pool surface is inaccessible.
- Hot tubs should have a lockable structural barrier that completely encloses the top of the hot tub and will not collapse under the weight of a child.
- It is preferable that the house should not form any side of the barrier.
    - In situations where a house does form one side of the barrier, the doors leading from the house to the pool should be locked and protected with alarms that produce a sound when a door is unexpectedly opened.
    - Alarms should continuously sound for 30 seconds and begin within 7 seconds of opening the door.

Adapted from Consumer Product Safety Commission: Safety Barrier Guidelines for Home Pools. (www.cpsc.gov)

the pool drain, leading to entrapment. The suction may be so strong that the person cannot pull away. Drowning can occur if the person's head is underwater and he or she is not able to break free of the drain. Disembowelment can also occur. Beginning in 2008, all public pools and hot tubs were required by law to have anti-entrapment drain covers installed. However, privately owned pools and hot tubs are not subject to the same law, so in many cases, home pool or hot tub drains may not be up to standard.

To protect against drain entrapment, remind people using the pool or hot tub to stay away from the drains and other openings that create suction. Install anti-entrapment drain covers and safety release systems, which offer protection from dangerous drain suction. Consider installing an automatic shutoff system for added protection. Clearly identify the location of the electrical cutoff switch for the pump, know where the pump switch is and know how to turn it off. Check with the Consumer Product Safety Commission (CPSC), Association of Pool and Spa Professionals, the National Swimming Pool Foundation or local authorities to find out more about safe pool and hot tub drainage systems.

Box 2-10

Minimizing Risk for Diving Injuries in Home Pool Settings

Most head, neck and spinal injuries in home pools result from diving into shallow water.

- Prohibit diving in aboveground pools, including inflatable "easy-set"-type pools. These pools are never safe for diving.
- Consult the Association of Pool and Spa Professionals (APSP), state law and local building codes for pool dimension guidelines to help you establish pool rules related to diving in an inground pool. For example:
  - Prohibit all dives into shallow water.
  - Only allow shallow-angle dives from the edge of the pool into deep water.
- Clearly mark the location of the breakpoint between shallow and deep water with a buoyed line and a contrasting stripe on the bottom 12 inches before the breakpoint. Mark the deck with signs that indicate the depth.
- Place "No Diving" signs on the deck near shallow water and on the fence or wall around the swimming pool or on a stand at the entry to the swimming pool area. Signs should be visible to anyone entering the pool or approaching shallow water.
- Prohibit elevated entry from any object not specifically designed for diving, such as chairs, fences or balconies.
- Install a diving board only if there is a safe diving envelope (the area of water in front of, below and to the sides of a diving board that is deep enough to prevent a diver from striking the bottom, regardless of the depth of the water or the design of the pool). The average home pool is not long enough or deep enough for safe springboard diving. It is the diving board manufacturer's responsibility to determine the necessary water envelope for safe diving.

Making, Posting and Enforcing Pool and Hot Tub Rules

Develop a list of pool and hot tub rules, post them prominently and enforce them without exception. Examples of rules you may establish include:

- Children permitted in the pool area only with adult supervision.
- Weak, inexperienced or nonswimmers must wear a life jacket.
- Always swim with a buddy.
- Please do not bring glass bottles or containers into the pool area.
- No running, pushing or rough horseplay.
- No diving **(Box 2-10)**.
- Please do not sit or play near the drain.
- Please do not play breath-holding games.

Post depth markers and "No Diving" signs, as appropriate **(Fig. 2-11)**. Use a buoyed line to show where the depth changes from shallow to deep, and make sure that weak or inexperienced swimmers stay in the shallow water. Keep extra U.S. Coast Guard-approved life jackets in a variety of sizes on hand for guests who may need them.

Fig. 2-11 Post "No Diving" signs on the fence surrounding the pool area or at the entry to the pool area.

Preparing for Emergencies

As a pool or hot tub owner, you need to be prepared to respond should an emergency arise. There are three simple things you can do to prepare for an emergency.

First, learn American Red Cross first aid and CPR.

Second, stock your pool area with a telephone, emergency contact information and basic water rescue equipment, including:

- Reaching equipment (such as a reaching pole or shepherd's crook) that can be used to pull a person to safety.
- Throwing equipment (such as a ring buoy, heaving jug or throw bag) that can be thrown to a person who is in trouble so that he or she can be pulled to safety.

One way to keep basic water rescue equipment organized and accessible is to make a safety post **(Box 2-11)**.

Box 2-11

How to Make a Safety Post

A safety post can be used to keep basic water rescue equipment organized and easily accessible poolside. To make a safety post, you will need:

- 4 inch × 4 inch post, 6 feet long
- Screw-in hanging hook large enough to hold the throwing equipment
- Throwing equipment, such as a ring buoy or a heaving jug*
- Reaching equipment, such as a 10- to 12-foot reaching pole
- Clips to secure the reaching equipment OR two 6-ounce cans with both ends removed and nails
- Plastic zipper bag
- First aid kit
- Emergency contact information, including phone numbers for summoning help and information that will help responders find your location (i.e., the street address and the names of the nearest cross streets)
- Safety poster or first aid booklet (optional)

1. On one side of the post, screw in the hanging hook about 1 foot from the top of the post.
2. On the other side of the post, secure the clips or nail the two open-ended cans, one about 1 foot above the other, no lower than 2 ½ feet from the bottom of the post.
3. Set the post 2 feet in the ground.
4. To make a heaving jug, put ½ inch of water or sand in the 1-gallon plastic jug and screw the top on tightly. (If the jug has a snap-on top, secure it with very strong glue.) Tie the rope to the handle of the jug.
5. Hang the ring buoy or heaving jug and line on the hanging hook.
6. Secure the reaching pole with the clips or put the reaching pole through the cans.
7. Put emergency contact information, the first aid kit and the first aid booklet or poster (if you are including one) in the plastic zipper bag and attach it to the top of the post.

*To make a heaving jug, you will also need a 1-gallon plastic jug with a top and 40–50 feet of lightweight rope.

Box 2-12

Emergency Action Plans

Having an emergency action plan in place and being familiar with the procedures it contains can save precious minutes when every minute counts.

To create an emergency action plan:

1. Identify the types of emergencies that could occur. Think about potential accidents, injuries, illnesses, weather events and other situations (such as power failures) that are likely to occur in your specific setting.
2. Develop and write down the procedure that is to be followed in the event of each emergency. Include:
   - The signal that will be used to indicate that the emergency action plan should be activated (such as a whistle blast, hand signals or both).
   - The steps for responding to the emergency, and who is responsible for each step.
   - The procedure for calling 9-1-1 or the local emergency number and directing emergency medical services (EMS) personnel to the scene.
   - What follow-up actions should be taken, if any.
3. Identify equipment that is needed to respond to the potential emergencies you have identified and stock it close by, in the pool area.

Third, make an emergency action plan **(Box 2-12)**. An **emergency action plan** consists of written procedures for dealing with specific potential accidents or emergency situations. Emergencies that should be addressed include injuries, illness, weather events, and situations such as power failures or drain entrapment. The emergency action plan details information that is needed to get control of the situation, such as:

- What signal will be used to indicate that there is an emergency.
- What equipment is available and where it is located (including the location of cutoff switches for pumps and hot tubs).
- Procedures for summoning emergency medical services (EMS) personnel (including the necessary phone numbers) and directing EMS personnel to the location.
- Procedures for providing aid and getting the situation under control, including what should be done and who should do it.

Review the emergency action plan with family members, guests and neighbors so that they are prepared to help implement the plan should the need arise.

Maintaining the Pool Area

Maintaining the pool area properly is a key safety measure.

- Keep the pool or hot tub water clean and clear. Chemically treat and test the water regularly. Follow the manufacturer's directions and safety instructions for chemical use. Clearly label chemicals and store them in childproof containers in a secured area.
- Keep the pool area properly illuminated.
- Completely secure covers in place immediately after using the pool or hot tub, and completely remove them before using the pool or hot tub.

Hosting Safe Pool Parties

One of the joys of owning a pool or hot tub is inviting others to enjoy it with you. Good planning can help to ensure that everyone has a good, and safe, time at your party. Be familiar with your homeowner's insurance policy. Additional coverage for the event may be required. Make sure that your guests (and their parents or guardians, if the guests are children) know that the party is a pool

party. Finally, make arrangements to ensure appropriate supervision during the party.

Consider hiring one or more certified lifeguards to be on duty for the duration of the party. The number of guests and the size of the pool will help you determine how many lifeguards are needed. Contact the local parks and recreation department or local swimming pools to get names of Red Cross-certified lifeguards who are willing to lifeguard at private parties. As the host, you are responsible for checking to verify that the certifications of the lifeguards you have hired are current and providing all appropriate rescue equipment.

Fig. 2-12 A "water watcher" card like this one can be used to identify people who have agreed to serve in this important role, and to remind them of their duties. *Courtesy of poolsafely.gov.*

Even when lifeguards are on duty, and especially if lifeguards are *not* on duty, children should be actively supervised by parents or other responsible adults. Before the gathering, identify responsible adults to serve as water watchers. The water watcher's job is to supervise the pool when it is in use **(Fig. 2-12).** Each water watcher must understand and accept responsibility for monitoring the activity in and around the pool and should be trained in first aid, CPR/AED and water safety. Also, remember to review your emergency action plan with your water watchers. Water watchers must agree to avoid distractions while they are on duty (for example using cell phones, socializing or engaging in other activities), and they should refrain from drinking alcohol before and while supervising water activities.

If the swimming portion of the party will go on for more than 1 hour, plan for rest breaks during which everyone is out of the water. Rest breaks are important for the lifeguards and water watchers, and they give the guests who are enjoying the water an opportunity to rest and warm up.

Also remember the importance of establishing and enforcing safety rules. Alcoholic beverages should be strictly prohibited for anyone who is, or will be, supervising or participating in water activities.

Using Hot Tubs Responsibly

In addition to all of the safety considerations detailed previously, hot tubs necessitate some special safety considerations. Although the hot water is relaxing and soothing and can improve circulation, it can also lead to problems if not enjoyed responsibly. Research has shown that high water temperatures can lead to drowsiness or even loss of consciousness, which can lead to drowning. In addition, the hot water can raise body temperature and blood pressure, placing the person at risk for heat-related emergencies. To safely enjoy a hot tub:

- Never use a hot tub when drinking alcohol or using other drugs.
- Never use a hot tub when you are alone.
- Do not increase the water temperature beyond 104°F (40°C).
- Limit your time in the hot tub to no more than 15 minutes.
- Do not use a hot tub if you are pregnant, take medications or have a chronic medical condition (such as high or low blood pressure, heart disease, epilepsy or diabetes) unless you have cleared this activity with your health care provider.
- Do not allow children younger than 5 years to use a hot tub. Children have difficulty adjusting to the extreme water temperature and are at risk for overheating.

The high water temperature in a hot tub provides a good environment for bacterial and parasite growth. If you own a hot tub, be sure to chemically treat and test the water regularly. Shower before entering the hot tub, because substances on the skin (such as dirt, lotion and perspiration) "use up" the chemicals used to treat the water, lowering their levels and increasing the risk for microbial growth in the hot tub. Also, abide by maximum capacity guidelines, because overcrowding of the hot tub reduces the effectiveness of the chemicals used to treat the water.

Waterparks

Waterparks (aquatic amusement parks) are a favorite source of recreation for many families **(Fig. 2-13)**. Waterparks feature a wide range of attractions, including high-speed water slides, wave pools, lazy rivers, and water playgrounds or spray pads. Each of these features presents unique risks. While most waterparks go to great lengths to maintain safety, accidents can still happen, ranging from slips and falls on hard surfaces to head, neck or spinal injuries following a collision with another patron or the bottom of the pool.

Fig. 2-13 Waterparks offer varied water-based rides and attractions and are a favorite destination for many people.

For a safe and enjoyable experience at the waterpark:

- Visit the waterpark's website in advance to get information about the attractions and safety rules.
- Dress appropriately. In some cases, this may mean wearing water shoes.
- Follow all posted rules, especially those related to height and weight restrictions and life jacket use. Speak with waterpark staff if you are unsure about any rules or procedures.
- Listen and follow all instructions given by the lifeguards at each attraction.
- Recognize that each attraction may have specific rules that must be followed, in addition to the standard rules. For example, on some attractions (such as certain water slides), life jackets are not permitted, while on other attractions (such as fast-moving winding rivers), life jackets are required.
- Get into the correct position before starting down a water slide: face-up and feet-first. Follow any additional instructions that you may be given to lower your risk for injury. For example, on speed slides, you may be instructed to cross your ankles and fold your arms over your chest to help prevent injuries.
- Do not let children hold onto, or be held by, others when using water slides.

Natural Bodies of Water

Natural aquatic environments offer great beauty and variety, so it is no wonder that people seek these environments out and have found so many different ways to enjoy them. However, nature is unpredictable! To safely enjoy recreational activities in and around natural bodies of water, knowledge of the unique hazards these environments present and respect for the unpredictable ways of nature are necessary.

Fig. 2-14 Spending the day on a river is a great way to connect with nature. *©CulturaHughWhitaker/Getty Images*

Rivers, Streams and Creeks

Rivers, streams and creeks offer plenty of choices for recreational activities, such as boating, fishing, rafting and tubing **(Fig. 2-14)**. But the feature of rivers, streams

and creeks that makes them so great for these activities—moving water—can also make them dangerous. Knowing how to anticipate and respond to the dangers posed by moving water can help you stay safe when you are enjoying time on or near a river, stream or creek.

Currents

Currents in rivers, streams and creeks are often unpredictable and fast moving. Changes below the surface of the water can cause abrupt changes in the direction and intensity of the current. In addition, the current may not be visible on the surface, even though it may be strong below the surface. Currents can be extremely powerful. Their power increases exponentially with the speed of the water. For example, a current flowing at a rate of 2 miles per hour can exert pressure of up to 33 pounds per square inch, while a current flowing at a rate of 8 miles per hour can exert pressure of up to 538 pounds per square inch! Always respect the power of the water. Avoid wading in water where there is a strong current that could knock you off your feet, and wear a U.S. Coast Guard-approved life jacket when you are fishing, hunting, boating, rafting or tubing. If your boat, raft or tube overturns and you find yourself in a current, float on your back downstream, feet-first. Back-paddle with your arms to steer out of the current, and then swim or wade toward shore.

Entrapments

The bottom of many rivers, streams and creeks is covered with rocks and other submerged objects. The powerful force of the moving water can trap your foot or leg against one of these submerged objects, causing you to fall and get pinned against the object under the surface of the water. Entrapments are a risk even in shallow moving water. Never try to stand up in moving water. If your boat, raft or tube overturns and you find yourself in the water, float on your back with your feet up and pointed downstream to avoid possible entanglement of your feet or legs.

Strainers

A strainer (such as a snarl of tree limbs) is an obstacle in a current that acts like a kitchen colander. If you are upstream of a strainer, you could become trapped in it as the force of the current carries you toward it. If you find yourself approaching a strainer, swim toward the object headfirst, grab any part of the strainer at the surface of the water and try to kick and climb up and over the top.

Hydraulics

Hydraulics are the vertical whirlpools that occur as water flows over an object, such as a low-head dam or waterfall, causing a strong downward force **(Fig. 2-15)**. Whitewater rapids are often filled with dangerous hydraulics. Even if the hydraulic appears small, the reverse flow of the water can trap and hold a person underwater. It is difficult and sometimes impossible to escape from a hydraulic. If you are caught in a hydraulic, resist fighting the current. Instead, try to swim to the bottom, get into the downstream current and then reach the surface.

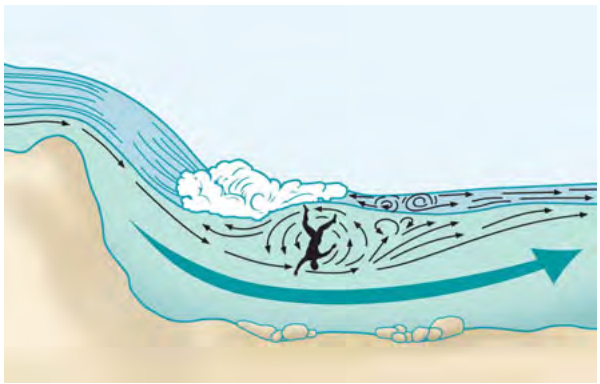


Fig. 2-15 A hydraulic is a powerful rotating force that develops as water flows over an object.

Dams

No dam is ever safe. When you are in, on or around the water, stay away from dams.

A fixed-crest/low-head dam is a barrier built across a river, stream or creek to control the flow of water **(Fig. 2-16)**. Some of the most harmless-looking low-head dams are often the most dangerous. Low-head dams with a thin line of whitewater across the surface can contain powerful hydraulic forces.

The opening of a dam can also create dangerous conditions. When the dam floodgates open, the water level can rise quickly below the dam, creating a wall of water. If the dam is part of a hydroelectric

power plant, the current created on opening the dam can pull anyone or anything (including boats) above the dam into danger. The area downstream of dams is also dangerous. Recirculating water currents caused by the movement of water over or through the dam can draw objects back toward the dam.

Lakes and Ponds

Lake and pond water is usually murky, making it difficult to see below the surface. In addition, the bottoms of lakes and ponds often contain hidden hazards (such as rocks, sunken logs or debris, plants and broken glass). Because it is difficult to evaluate the depth of the water or to see underwater hazards, lakes and ponds are generally not safe for diving. The murkiness of the water can also make it difficult to notice a swimmer who is in trouble, especially if the swimmer is submerged.

When enjoying recreational activities in, on or near a lake or pond, enter the water with caution, and always enter feet-first. Wear a U.S. Coast Guard-approved life jacket (if you are boating or if you are a weak or inexperienced swimmer) and protective water shoes. Many lakes have designated swimming areas that may or may not be guarded. If the lakefront has designated swimming areas or lifeguards on duty, swim only in these areas **(Fig. 2-17)**. Be aware that many forms of wildlife also call the lake or pond home and avoid lakes or ponds that are inhabited by animals that can cause injury to humans, such as snapping turtles and alligators **(Box 2-13).**

Fig. 2-16 Stay away from dams. The chances of surviving an aquatic emergency involving a dam are slim.

Fig. 2-17 Some lakes have designated areas for swimming and lifeguard supervision.

Box 2-13

Freshwater Aquatic Wildlife

Many different forms of wildlife live in or near freshwater areas, including rivers, streams, creeks, lakes and ponds.

- Alligators can be found in freshwater in some southern states, such as Florida, Louisiana, Georgia and Texas. They are very dangerous, especially to small children.
- Snapping turtles are large freshwater turtles that often live in and around shallow ponds, lakes and streams. They have powerful jaws and their bites can cause severe injury. Avoid approaching or provoking a snapping turtle.
- Snakes are found in a variety of freshwater habitats, including streams, rivers, lakes and ponds. Snakes rarely pose a threat. Leave them alone and swim away slowly.
- Leeches are usually found in shallow, slow-moving freshwater. You may not see a leech in the water; it is more likely that you will find one on your skin when you come out of the water. Leeches are not harmful. To remove a leech from your skin, gently and slowly pull it off.

Alligator. *© iStockphoto.com/Don Fink*

Snapping turtle. *Image © Ryan M. Bolten, 2014. Used under license from Shutterstock.com*

Swimming and other aquatic activities should occur only in areas with good water quality. Conditions in these bodies of water change constantly. Many communities test lakes and ponds regularly for pollution and disease-causing organisms. Obey posted signs and avoid going in the water if the water quality is poor.

Oceans

For many people, a trip to the beach ranks high on their list of favorite things to do. After all, many people plan vacations around visiting a beach or engaging in other activities that take place in or on the ocean, such as boating, fishing, snorkeling, diving or surfing. As with all aquatic environments, however, knowledge of potential dangers is key to staying safe.

Fig. 2-18 Waves can be powerful, even on beaches designated for swimming and supervised by a lifeguard. Always pay attention to posted signs, and never swim at unguarded ocean beaches or in areas not designated for swimming.

Waves

If you plan to swim in the ocean, stick to areas designated for swimming and pay attention to posted signs. These beaches often have lifeguards on duty, but some may not. Even in designated swimming areas, waves at ocean beaches can become quite large. Breaking waves are tremendously powerful, capable of moving large objects and knocking a person over **(Fig. 2-18)**. The weight of a wave and the power of the crashing water can hold a person underwater—1 cubic foot of water weighs 62 pounds! Breaking waves near rocky shores are especially dangerous and can cause severe injuries or even death. Avoid swimming along rocky shorelines. When you are walking or playing along any shoreline, pay attention to the waves, and never turn your back on the ocean.

Currents

The action of breaking waves against the beach or coastline creates currents.

Longshore currents

Longshore currents run parallel to the shore. A longshore current can quickly carry you away from your original point of entry. If you find yourself caught in a longshore current, try to swim toward shore while moving along with the current.

Rip currents

Rip currents move water away from the shore or beach and out to sea beyond the breaking waves **(Fig. 2-19)**. A visual cue to a rip current is a narrow strip of choppy, turbulent water that moves differently from the water on either side of it. Rip currents typically break apart just past the line of breaking

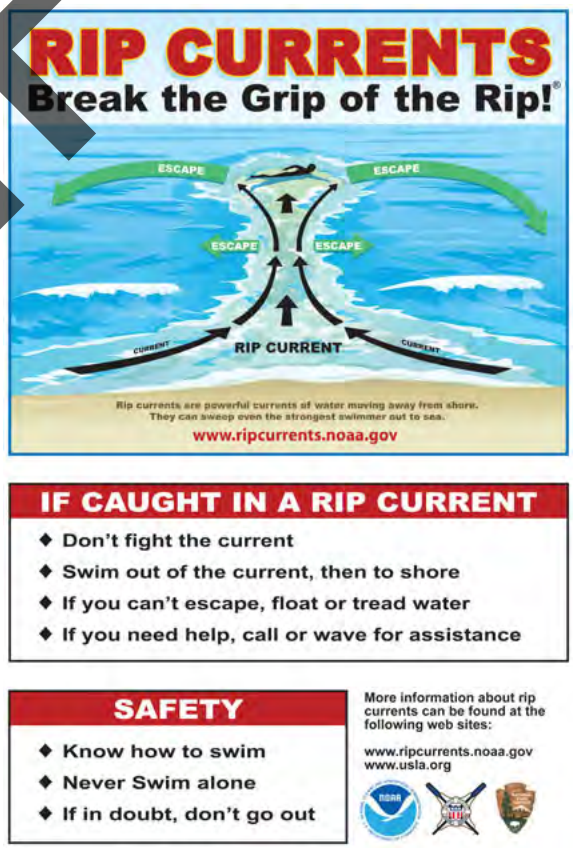


Fig. 2-19 Rip currents are powerful currents of water moving away from the shore. If you are caught in a rip current, swim parallel to the shore until you are free, or let the current take you out and then swim back after the current breaks apart.

waves and are usually no more than 80 feet wide. Under gentle surf conditions, rip currents may be more frequent, but less intense. With periods of high-wave activity, however, rip currents tend to form less often but are much stronger.

Rip currents are dangerous because they are very fast, often faster than a person can swim, and they carry a person away from shore. Even though most rip currents break apart near the shore, they can still take a person into deep water or a frightening distance from the shore. In rare cases, rip currents can sometimes push a person hundreds of feet beyond the surf zone. Rip currents account for more than 80 percent of rescues performed by surf beach lifeguards, and it is estimated that each year more than 100 people die due to rip currents on our nation's beaches.

Rip currents can be a challenge to even the strongest and most experienced swimmers. If caught in a rip current, do not panic! Swim parallel to the shore until free of the current. Once free, turn and swim toward shore. Alternatively, you can just let the rip current take you out to sea, and then swim back after the current breaks apart. If you are too exhausted to swim to shore, signal a lifeguard by calling and waving for help.

Tidal currents

Tidal currents are generated by tides. The change in the water level that occurs as the tide comes in and goes out creates a horizontal current called the tidal current. Tidal currents are somewhat inconsequential in wide areas, such as along an ocean shoreline, but in narrow areas, such as inlets, estuaries and bays, tidal currents can be very strong and fast, and should be avoided.

Because tidal currents are associated with the tides, they are predictable. Tides (and thus, tidal currents) are caused by the gravitational forces of the sun, the moon and the Earth's rotation. The movement of the moon has the strongest influence on tidal currents, which are strongest during a new or full moon (spring tides) and weakest when the moon is in its first or third phases (neap tides).

Aquatic plants

Weeds, grass and kelp often grow thickly in open water, posing a potential source of entanglement for a swimmer. Always stay clear of any patch of plants near the surface. If you find yourself caught up in any aquatic plant life, avoid quick movements, which may worsen the situation. Try to stay horizontal at the surface, swimming slowly and gently out of the plants, preferably along with a current.

Marine life

Before going into any ocean, be knowledgeable about the local marine life. Know which forms of marine life may be dangerous, how to avoid them and how to care for any injuries. On supervised beaches, look for signs alerting you to the presence of hazardous marine life. Shuffle your feet as you enter the ocean to create a disturbance and stir up any marine life that may be resting on the bottom so that you do not accidentally step on it.

Many forms of marine life (such as jellyfish, sea urchins, stinging coral and stingrays) cause stinging wounds. Stings from marine life can have effects that range from merely painful to very serious (such as allergic reactions that can cause breathing and heart problems, paralysis or even death). If the sting occurs in water, move the person to dry land as soon as possible and provide basic first aid to neutralize the toxin and reduce pain **(Box 2-14)**. Call 9-1-1 or the local emergency number if the person has been stung by a lethal jellyfish, does not know what caused the sting, has a history of allergic reactions to stings from aquatic life, has been stung on the face or neck or starts to have difficulty breathing.

Many people also worry about being attacked by a shark while in the ocean. The chance of a shark attack is relatively small, but because the consequences are severe, it is smart to take steps to minimize your risk **(Box 2-15)**.

Box 2-14

Care for a Jellyfish Sting

Bluebottle jellyfish.

- Move the person to dry land as soon as possible.
- Offset the toxin by flushing the area as soon as possible. Do not rub the wound or apply fresh water, ammonia or rubbing alcohol because these substances may increase pain.
  - For most types of jellyfish typically found along the east and west coasts of the United States, flush the injured area with vinegar for at least 30 seconds to offset the toxin. You can also apply a baking soda slurry if vinegar is not available.
  - For bluebottle jellyfish (Portuguese man-of-war), which are found in tropical waters, flush with ocean water instead of vinegar.
- Carefully remove any stingers or tentacles with gloved hands or a towel.
- After deactivating or removing the stingers or tentacles, immerse the affected area in water as hot as can be tolerated for at least 20 minutes or until the pain is relieved. If hot water is not available, use dry hot packs or, as a second choice, dry cold packs to help decrease the pain. Do not apply a pressure immobilization bandage.

Note: Call 9-1-1 or the local emergency number if the person has been stung by a lethal jellyfish, does not know what caused the sting, has a history of allergic reactions to stings from aquatic life, has been stung on the face or neck or starts to have difficulty breathing.

Box 2-15

Staying Away from Sharks

- Stay in a group. Sharks are more likely to attack a solitary person than a group.
- Avoid being in the water at night, dawn or dusk, when sharks are most active and not easily seen.
- Do not enter the water if bleeding from an open wound or if menstruating—sharks are attracted to blood and their ability to detect blood is very keen.
- Do not wear shiny jewelry, because the reflected light resembles fish scales.
- Do not enter the water in areas where there are signs of baitfish, especially those used by sport or commercial fishermen. Feeding areas or areas where sewage, runoff or rivers flow into the sea are also dangerous. Diving sea birds are good indicators of these areas.
- Use extra caution when waters are murky and avoid brightly colored clothing—sharks see contrast particularly well.
- Avoid excess splashing and do not allow pets in the water because their erratic movements may attract shark attention.
- Exercise caution when occupying the area between sandbars or near steep drop-offs—these are favorite hangouts for sharks.
- Do not enter the water if sharks are known to be present and evacuate the water swiftly but calmly if sharks are sighted.
- It goes without saying, but do not harass or provoke a shark if you do encounter one!

Staying Safe While Engaging in Water Activities

Specific activities that are enjoyed in, on or around the water have specific safety considerations.

Swimming

To stay safe while swimming, never swim alone and always swim in a supervised area. In addition, be aware of situations and behaviors that could threaten your safety while swimming.

Exhaustion

One of the dangerous "too's"—too tired—is particularly likely to affect swimmers. Becoming too tired while swimming can put a person at risk for drowning. Exhaustion (also referred to as fatigue) simply means that the person no longer has the energy to keep swimming or floating.

Exhaustion can occur as a reaction to cold water, after being in the sun for too long, as a result of being dehydrated, as a result of swimming too long or too hard, or from any combination of these factors. It is more likely to occur in swimmers who:

- Swim early in the season when the water is cold.
- Swim too much before they are really in shape.
- Do not know which strokes to use to conserve energy (for example, the elementary backstroke takes relatively little energy compared to a front crawl).
- Are young, inexperienced or both.

To prevent exhaustion, take breaks and rest often while swimming or doing other water activities. Be aware of your abilities and environment, and listen to your body.

Hyperventilation and Extended Breath-holding

Some swimmers believe that **hyperventilation** (rapid, deep breathing) before prolonged swimming under water increases the amount of oxygen in the body, allowing the swimmer to hold the breath longer. In fact, hyperventilation is a dangerous practice that may result in drowning. Rather than increasing oxygen levels in the blood, hyperventilation lowers carbon dioxide levels. This is risky because the drive to breathe is controlled by the amount of carbon dioxide in the blood. When a person hyperventilates and then swims underwater, the blood oxygen level can drop to a point that is so low that the swimmer passes out before the brain signals that it is time to breathe. When the person finally does take a breath instinctively, water rushes in and the drowning process begins.

Hyperventilation prior to submerging is an extremely dangerous practice that no swimmer should ever engage in. Also be aware that children who play competitive underwater games (such as trying to see who can hold his or her breath under the water the longest or who can swim the farthest distance underwater before coming up for air) are also at risk for hyperventilation **(Fig. 2-20)**. Teach children that competitive or repetitive underwater games can be extremely dangerous and stop this behavior if you see it occurring.

Fig. 2-20 Hyperventilation (taking a series of rapid deep breaths before submerging in an effort to hold the breath longer while underwater) is an extremely dangerous practice that can lead to drowning.

Diving

Injuries occurring from diving can be very severe or even fatal. For example, head, neck or spinal injuries can result in paraplegia (paralysis from the waist down), quadriplegia (paralysis from the neck down) or drowning.

Most diving injuries take place in water 5 feet deep or less. Many involve the use of alcohol or other drugs. Diving into open water that is shallow, diving into the shallow end of a pool, diving into aboveground pools and unsupervised diving from starting blocks cause most diving accidents.

Fig. 2-21 Aboveground pools are *never* safe for diving.

Areas that are *never* safe for diving include aboveground pools (including inflatable "easy-set"-type pools) and unfamiliar bodies of water, especially if the water is murky and you cannot evaluate the depth of the water or see hazards under the water **(Fig. 2-21)**. The deep ends of some inground pools are appropriate for diving, but you need to evaluate each pool carefully and obey any posted signs related to whether diving is permitted, and if so, in what areas of the pool. Typical locations of "No Diving" signs are on the deck near the edge of the pool and on walls or fences near shallow water. Many kinds of warnings signs are used, such as the following:

- "No Diving" painted on the deck in contrasting colors
- Tiled lettering embedded into the deck in contrasting colors
- Universal "No Diving" tiles embedded into the deck
- "No Diving" signs mounted on walls, fences or stands

Two common home pool designs are the hopper-bottom pool and spoon-shaped pool **(Fig. 2-22)**. A hopper-bottom pool has a bottom that angles sharply up on all four sides from the deepest point. Thus, the diving envelope (the area that is safe to dive into) is much smaller than it appears **(see Fig. 2-22A)**. Diving into a hopper-bottom pool can be like diving into a funnel. A spoon-shaped pool also may present risks to safe diving because the distance from the end of the diving board or the side of the pool to the slope of the bottom is greatly reduced **(see Fig. 2-22B)**. The bottom contour of the spoon-shaped pool may give a false sense of depth and bottom area throughout the deep end.

Guidelines for lowering the risk for diving injuries are given in **Box 2-16**.

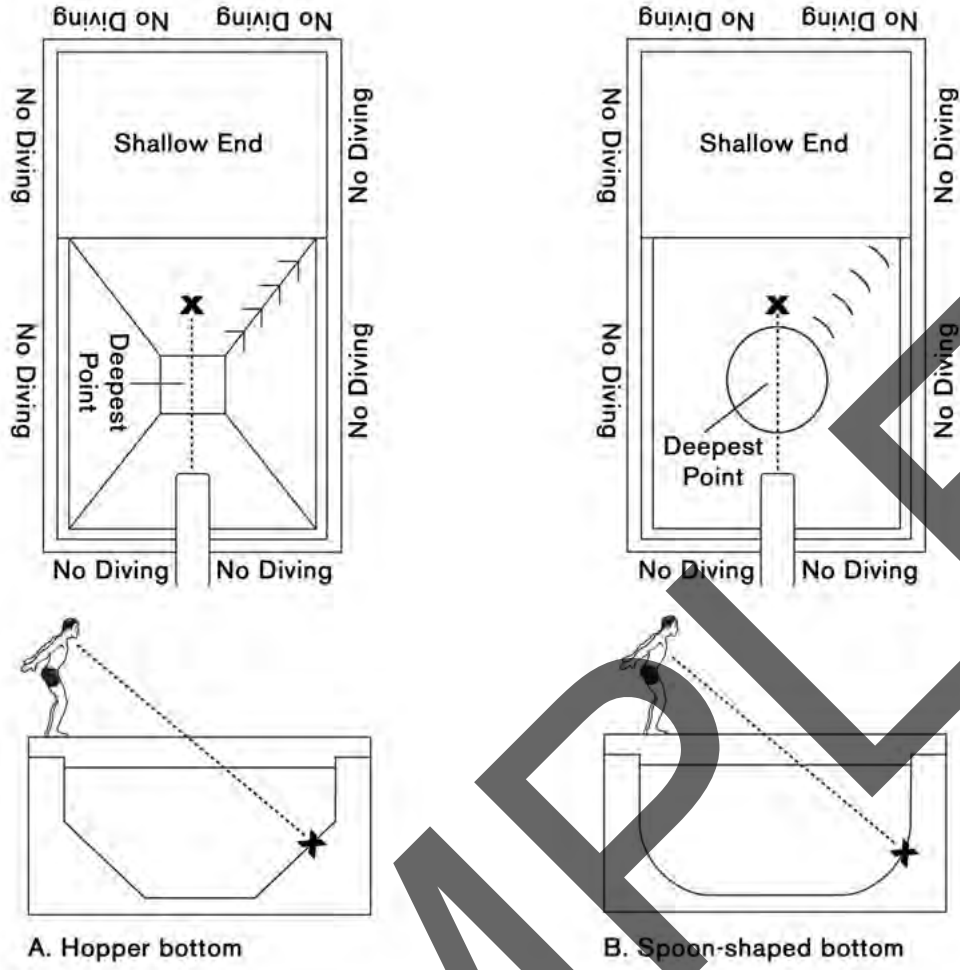


Fig. 2-22 Home pools often feature hopper bottoms or spoon-shaped bottoms, making them unsafe for diving. **(A)** Hopper-bottom pool. **(B)** Spoon-shaped pool.

Box 2-16

Guidelines for Lowering the Risk for Diving-Related Injuries

- Never drink and dive.
- Do not dive alone.
- Do not dive into unfamiliar bodies of water.
- Know the depth of the water (it should be at least 9 feet deep) and the shape of the pool bottom before you dive.
- Dive straight ahead, never off to the side.
- Make sure the area you are diving into is clear of swimmers or other obstacles before you dive.
- Do not dive from a running start.
- Do not dive from any structure that is not specifically designed for diving.
- Do not try to dive headfirst through something (such as an inner tube) or over something.

Derived from the National Pool and Spa Institute: American National Standard for Residential Inground Swimming Pools ANSI/NSPI-5 2003. Alexandria, Virginia: National Pool and Spa Institute, 2003.

Boating

Recreational boating is a term used to describe the operation of open motorboats, cabin motorboats, sailboats, canoes, kayaks, personal watercraft (such as Jet Skis and wave runners; **(Box 2-17)** and other types of watercraft. Boating can be a safe and enjoyable pastime, but it is important to know the dangers. In 2012, the Coast Guard counted 4515 recreational boating accidents, which resulted in 651 deaths and 3000 injuries. Of the deaths, approximately 71 percent were caused by drowning.

Alcohol is a leading contributor to recreational boating accidents, especially those resulting in fatalities. Other contributing factors include operator inattention, operator inexperience, improper lookout, machinery failure and excessive speed.

Preparation and education can go a long way toward preventing recreational boating accidents, and surviving an accident if one should occur. First, check with your state for local laws and regulations related to boating. Second, obtain the proper training before operating a watercraft and stay up-to-date. Training is not just recommended for people

Box 2-17

Personal Watercraft Safety

When operating a personal watercraft, wear a U.S. Coast Guard-approved life jacket and develop a float plan before leaving the shore. In addition:

Image © Wollertz, 2014. Used under license from Shutterstock.com

- Know the local laws and regulations. Some states have special laws governing the use of personal watercraft that address operation, life jacket use, registration and licensing requirements, minimum age requirements, education, environmental restrictions and required safety equipment.
- Operate personal watercraft with courtesy and common sense. Pay attention to surroundings and follow the traffic pattern of the waterway. Obey no-wake and speed zones.
- Use extreme caution around swimmers, surfers and other boaters. Run personal watercraft at a slow speed until the craft is away from the shore, swimming areas and docks. Avoid passing close to other boats and jumping wakes. This behavior is dangerous and often illegal.
- Ride with a buddy. Always ride in groups of two or three. You never know when an emergency might occur.
- Always attach the engine cutoff lanyard to yourself and the personal watercraft during operation.

operating large boats—motorboats (both open and cabin type) and personal watercraft are the most common types of vessels involved in reported accidents. Boating safety courses can teach you the fundamentals of safely operating and navigating your vessel, as well as provide information about local water conditions and hazards. Boating safety courses are offered through the American Red Cross (www.redcross.org), U.S. Coast Guard Auxiliary (www.cgaux.org), United States Power Squadrons (www.usps.org) and local state boating authorities. Information about safe boat handling for canoes, kayaks and sailboats can be obtained from the American Canoe Association (www.americancanoe.org) or U.S. Sailing (www.ussailing.org), respectively. The National Association of State Boating Law Administrators (NASBLA; www.nasbla.org), a national nonprofit organization that represents the recreational boating authorities of all 50 states and the U.S. territories, works to establish standards for boating safety education and is a valuable source of information about recreational boating safety courses.

In addition to educating yourself about the safe operation of your watercraft, there are additional steps you can take to promote safety while boating, including wearing a U.S. Coast Guard-approved life jacket, having appropriate rescue and emergency response equipment on hand, creating a float plan, being knowledgeable about local water conditions and hazards and being prepared for changes in the weather.

Wear a Life Jacket

In 2012, 84 percent of the people who died from drowning as a result of a recreational boating accident were not wearing life jackets. This statistic underscores the importance of always wearing a U.S. Coast Guard-approved life jacket when boating. Most boating emergencies happen suddenly, leaving you little to no time to "put on a life jacket if you need it." Put your life jacket on at the dock and do not take it off until you return **(Fig. 2-23)**. Even good swimmers should wear a life jacket when boating because the potential always exists for falling or being thrown into cold or dangerous water, or for sustaining a head injury following a collision. In cold water, having a life jacket on can be the single most important factor in surviving the incident. Many states have laws requiring life jacket use for people being towed on water skis, tubes or similar devices, and for people who are operating personal watercraft.

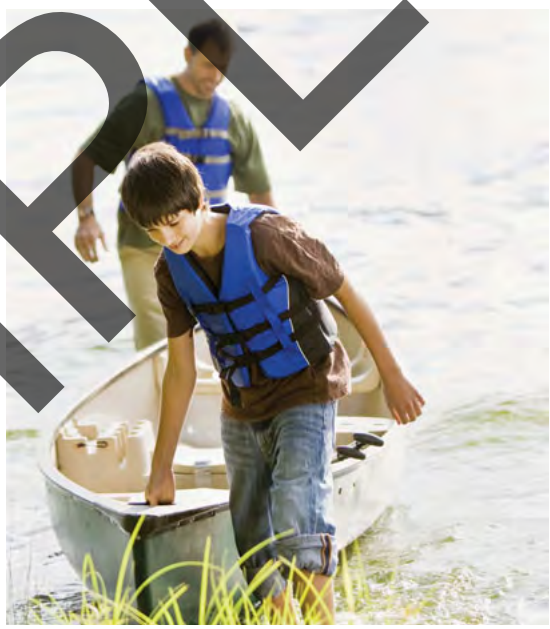


Fig. 2-23 When boating, put your life jacket on before you leave the dock and do not take it off until you return to shore, even if you are an experienced swimmer. *© Andersen Ross/Getty Images*

Be Prepared with Rescue and Emergency Response Equipment

Make sure your watercraft is stocked with equipment that can help you in case you run into trouble. In addition to extra life jackets and equipment for throwing and reaching assists, keep equipment for signaling distress on board. Equipment for

communicating distress visually (such as flags, flares or lights) and sound-producing devices (such as an air horn or an athletic whistle) is required for some boats per U.S. Coast Guard regulations. Fire extinguishers may also be required on board per U.S. Coast Guard regulations.

It is also important to have a reliable way to communicate with the shore and other boats in case of an emergency. In many boating emergencies, a nearby boat may be able to provide assistance and can respond quickly. A marine very high frequency (VHF) radio is a two-way communication device that allows boaters to contact other boaters, bridge operators and harbor officials. In addition, many of these devices can provide rescue personnel with your exact location. All marine rescue personnel and commercial ships use this type of radio, and in many locations, the U.S. Coast Guard monitors VHF channel 16 at all times, 24 hours a day, 7 days a week. Also consider installing marine cell phone signal boosters to extend the range of your cell phone signal while you are on the water.

Finally, make sure the boat has the proper equipment to assist with reboarding, should that become necessary. Larger boats may have a rope ladder or dock line available. Canoes and kayaks may have short lengths of rope attached to the ends of the canoe or kayak (called "painters") and end loops that look like handles that may be helpful for righting and reentering the craft.

Create a Float Plan

A float plan is a written document that provides the details of a boating trip. It contains information about the vessel, the people on board and the planned itinerary. Before you leave shore, create a float plan and leave it with a responsible person on land who can initiate rescue efforts if you fail to return or check in on time.

Be Knowledgeable about Local Water Conditions and Hazards

It is important to understand local water conditions and hazards. Changing tides can cause significant changes in water depth. Sandbars, currents, aquatic life and bottom conditions are constantly changing and creating new hazards. Certain areas may become crowded with commercial traffic. In some aquatic environments, it may be necessary to pass under a drawbridge or go through a lock. The U.S. Coast Guard, U.S. Army Corps of Engineers, marina staff and local authorities can provide helpful information about local water conditions and hazards.

Be Prepared for Changes in the Weather

In many open-water environments, the weather and water conditions can change rapidly and dramatically. Bad weather is always dangerous, but it can be deadly for boaters far away from the shore. Large waves, high winds and changing currents can make travel difficult and may lead to capsizing.

Remember the adage, "*Know before you go*." Always check the weather before leaving and then keep an eye on the weather throughout the day. Boats equipped with marine VHF radios can monitor local forecasts. In addition, be alert to environmental cues to incoming weather changes, such as changes in cloud cover or sky color, a sudden drop in temperature, abrupt changes in wind speed or direction or a falling barometer. **Box 2-18** summarizes actions to take if severe weather develops.

Box 2-18

Boating Safety: If Severe Weather Develops

- Slow down and maintain enough boat speed to steadily move forward but still stay in control.
- Check to make sure that everyone on board is adequately dressed and wearing a properly fitting life jacket.
- Turn on the boat's navigation lights.
- Head into waves at a 45° angle; if on a personal watercraft, approach waves at a 90° angle.
- Have passengers sit low in the boat or on the floor near the centerline. Keep your shoulders between the gunwales on small boats. Do not sit on the gunwales, bow, seatbacks or any other area not designed for seating.
- Remain still and do not move about the boat.
  - If you must move, maintain three points of contact.
  - Do not stand up in small boats.
- Anchor the boat, if necessary and safe to do so.

Tubing and Rafting

Tubing and rafting are popular river sports. Depending on the river and the time of year, the experience may range from leisurely drifting downstream on calm waters to an adrenaline-packed thrill ride over whitewater rapids **(Fig. 2-24)**. If you are planning to tube or raft with a tour company, check to make sure that the tour guide is qualified and well-trained. The local chamber of commerce can provide information about accredited tour guides and companies. In addition, following these guidelines can help you have a safe and enjoyable rafting or tubing trip:

Fig. 2-24 Whitewater rafting tours are popular with those seeking a thrill.
Image © VILevi, 2014. Used under license from Shutterstock.com

- Never go tubing or rafting after a heavy rain or if flood or flash flood warnings are posted.
- Wear a U.S. Coast Guard-approved life jacket, a helmet (if required) and water shoes.
- Do not consume alcohol while tubing or rafting.
- Always abide by the specifications regarding the number of people the raft or tube can accommodate. Never overload your raft or tube.
- Create a float plan and leave it with a responsible person on shore if you are setting out on your own.

Fishing and Hunting

In most fishing- and hunting-related accidents involving the water, the person never intended to get in the water. To lower your risk of drowning as result of a water-related accident while hunting or fishing:

- Take a boating safety course if you plan to use a boat to fish or hunt.
- Always wear a U.S. Coast Guard-approved life jacket if you intend to be in a boat or near the water.
- Do not consume alcohol while hunting or fishing.
- Always hunt or fish with a friend.
- When you are in a boat, keep a wide base of support and a low center of gravity and use your hands to maintain your balance.
- Be especially careful of your footing when walking near water.
- Dress properly for the weather.
- Have a reaching or throwing device on hand.

Outdoor Ice Sports and Activities

In parts of the country when natural bodies of water freeze during the winter months, people often enjoy outdoor ice sports and activities, such as skating, ice fishing and snowmobiling **(Fig. 2-25)**.

Fig. 2-25 Even in cold parts of the country, people find ways to enjoy outdoor aquatic activities all year long. *Image © Stephen McSweeney, 2014. Used under license from Shutterstock.com*

There is no such thing as 100 percent safe ice. Ice on smaller, shallower and slower-moving bodies of water tends to be more solid than ice on larger, deeper and fast-moving bodies of water. Ice that forms over open water may be unsafe if the following are present:

- Springs or fast-moving water
- Wind and wave action
- Waterfowl and schooling fish
- Decomposing material in the water
- Water bubblers (devices designed to keep the water near boat docks from freezing thick)
- Discharge from an industrial site or power production facility
- Objects protruding through the ice, such as tree stumps

Do not go out on ice that has recently frozen, thawed and then frozen again. This happens in the spring and early winter as temperatures change often. Wait until the outside temperature has been below freezing long enough that at least 4 inches of solid ice forms over the entire area. Always check the ice thickness before going out using a chisel, cordless drill or ice auger. Ice should be solid and at least 4 inches thick if you are planning to walk on it. However, this thickness is not enough for snowmobiles, all-terrain vehicles or other vehicles, or if more than one person will be on the ice. Be aware that the thickness may not be the same over the entire area, so always use caution, even if the ice is thick enough in the place where you took your measurement.

Dress in several loose-fitting, lightweight layers, instead of one heavy layer. Wear a hat, boots and a water-resistant outer layer. Wear a life jacket under your outer layer, unless you will be driving onto the ice in an enclosed vehicle, such as a truck or car. If the truck or car were to fall through the ice, a life jacket worn under your clothes could hinder your ability to escape from the vehicle quickly.

Whenever you are planning on going out on the ice, always go with a friend and let someone on shore know where you are and when you will return. Look for objects sticking up through the ice and mark them as hazards. Be prepared in case the ice breaks. Have something at hand to throw or extend to a person who needs help, such as a rope with a weighted end, a long tree branch, a wooden pole or a plastic jug with a line attached.

When ice breaks, it usually occurs suddenly and without warning. The sudden surprise of falling through the ice coupled with the shock of the cold water often causes the person to panic. Almost immediately, the exposure to the cold water reduces the ability to move the arms and legs, which can further increase panic as any effort to get out of the water becomes even more difficult. Ice rescue picks (ice claws), which are handles with sharp metal spikes that a person can use to climb back onto the ice after falling through, can be invaluable in this situation and are a wise investment if you plan on going out on the ice.

If you fall through the ice, try to stay calm. Turn toward the direction you came from, since the ice is likely to be strongest there, and quickly get into a floating position on your stomach. Bend your knees to help trap air in your pant legs and boots. Reach forward onto the broken ice, but do not push down on it. (If you have ice rescue picks, dig the points of the picks into the ice.) Use a breaststroke or other kick to push your body farther onto the ice. Once you are on the ice, roll away from the break area. If a companion falls through the ice, encourage the person to remain calm and use a reaching or throwing assist (described in detail in Chapter 3) to help pull the person to safety.