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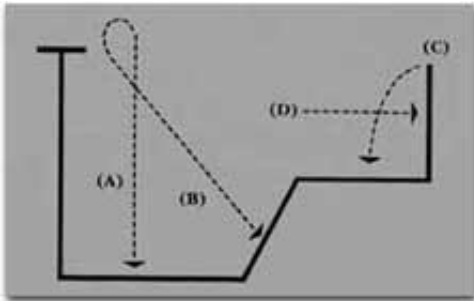
Prevention of Aquatic Spinal Injuries

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Spinal Injuries in the Aquatic Environment Part 1: Prevention

by Gerald M. Dworkin

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One hot Sunday afternoon, a family was enjoying a leisurely barbeque around their new backyard swimming pool. The children played a game of tag in the pool, while the father cooked on the grill. The mother was carefully watching the children as she sat along the pool edge.

Suddenly, the 12-year-old boy quickly climbed out of the pool, in order to avoid being tagged, and immediately dove back in. In the boy's effort to keep away from his sister, who was trying to tag him, he dove too deeply into the water and struck his head on the pool's bottom. The child floated motionless to the water's surface. The mother quickly jumped into the pool and supported the boy by placing one arm under the child's neck, and the other arm under the child's knees. She then lifted the boy onto the pool deck.

In the mother's attempt to rescue her child, she actually further aggravated a spinal cord injury that occurred when the boy dove into the water and struck his head on the pool's bottom.

Each year, doctors identify and treat approximately 10,000 new spinal cord injuries in this country. The average age of onset is 28.7, and the most common age is 19. Fifty percent of the injuries occur in the 15- to 24-year age group. Eighty-two percent of all spinal cord injuries occur in males.

The following statistics represent the etiologic causes of spinal cord injury in this country: Motor Vehicle 36.5%; Falls 15.8%; Gunshot 11.6%; Diving 10.6%; Other Causes 24.5%.

The major cause of these devastating traumatic injuries is, as you probably expected, motor vehicle accidents. However, the second leading cause are those injuries resulting from sports and recreation activities. Water-related activities are the number one cause of spinal cord injuries resulting from sports and recreation activities.

Each year, approximately 13,000 diving-board-related injuries are sufficiently serious to be brought to hospital emergency rooms; diving accidents cause approximately 800 spinal cord injuries. The Consumer Product Safety Commission (CPSC) estimates that this is a yearly occurrence.

According to the CPSC, "... one of the major accident patterns associated with swimming pools was striking the bottom or sides of the pool because of insufficient depth for diving or sliding..." Further, "... in addition to striking the bottom of the pool, people are injured when they hit protruding waterpipes, ladders, or other objects in the pool."

Diving should be strictly prohibited in shallow water. Over half of the swimming pools in the United States are above-ground vinyl swimming pools, most of which have a constant depth of three to three and-one-half feet. In order to gain entrance into a pool of this type, most pools provide a ladder or platform. Many injuries occur each year when children or adults attempt to dive into the pool from these ladders and platforms.

There are four major factors which can cause spinal injuries in aquatic facilities. By realizing this, you can develop or adopt prevention and training strategies and activities to reduce or prevent these injuries from occurring. These factors include:

- (A) Diving too deeply off a diving board and striking the bottom before leveling off.
- (B) Diving too far out off the diving board or sliding too far out off the slide and hitting the bottom incline of swimming pools.
- (C) Diving or sliding into shallow water and striking the bottom.
- (D) Striking an object underwater(i.e. side of the pool, obstacles, or another swimmer.

Diving or sliding injuries result from the victim propelling into head contact with some part of the pool or facility bottom. The position of the head and neck, the impact site, and the victim's direction all determine the resulting spinal injury.

You should suspect any victim of a diving or sliding accident of having a spinal injury and handle the victim accordingly.

There are several nationally recognized spinal injury prevention programs you can integrate into you school curriculum or community swim program. The two largest programs are the National Swimming Pool Foundation's Learning How to Dive program, and the Feet First, First Time, Inc. program.

The National Swimming Pool Foundation (NSPF), in cooperation with the National Spa and Pool Institute (NSPI), produced an eight minute film, "Learning How to Dive," on safe diving techniques, and accident prevention principles. Using this film is an ideal way to instill the importance of proper diving techniques; you can use it in a school classroom setting, or at any social, recreational, or educational gathering of youth groups. You can also integrate the film into organized progressive swimming courses conducted through such organizations as the American Red Cross, the YMCA, and the Boy Scouts of America.

"Learning How to Dive" presents the story of a young boy who broke his neck when diving into shallow water. The film instructs proper diving techniques with the help of Olympic Gold Medal Diving Champion Greg Louganis, U.S. Olympic Coach Ron O'Brien, and actor Patrick Wayne. (You can obtain "Learning

How to Dive” from the National Swimming Pool Foundation, 10803 Gulfdale, Suite 300, San Antonio, Texas 78216; 512-341 -5153, or through your local NSPI chapter or regional office.)

Another program that you can easily implement within your school or community recreation setting is a diving accident prevention program called, “Feet First, First Time.” This is a proven prevention program for teenagers and adults. The program aims to convince swimmers to check the depth of the underwater area by jumping, not diving head-first, even if they are certain it’s safe to dive.

Feet First, First Time, Inc. provides a marketing guide to help you start safe diving and prevention programs. The booklet contains an explanation of how the program began and useful ideas to promote prevention activities. The complete marketing guide follows proven techniques used by advertising agencies and public relations firms.

(You can get the Feet First, First Time marketing guide from Feet First, First Time, Inc., North Davis Highway, Pensacola, Florida 32523-8900; 904-478-4460.)

The following sections contain various prevention principles and activities you can implement to help reduce or eliminate spinal cord injuries in the aquatics environment. All aquatic facilities should enforce these principles.

Principles of Safe Diving

Know the water depth before you dive. Be sure there are no submerged obstacles or surface objects. Don’t dive into an aboveground pool or into the shallow end of a swimming pool. Don’t dive into unfamiliar bodies of water.

Plan your dive path. Don’t dive from the edge across the narrow part of a swimming pool without having at least 25 feet of clear dive path in front of you. Don’t run and dive.

When you dive, you must steer up. Hold your head and arms up, and steer up with your hands. Keep your arms extended and head and hands up during the dive.

Practice carefully before you dive. Test the diving board for its spring before using it to dive. Don’t do back dives or fancy dives, or dives with straight vertical entries without proper guidance and instruction, and then only in pools designed for diving.

Don’t dive from retaining walls, ladders, slides or other pool equipment. Don’t dive from rooftops, balconies, ledges, or fences.

Don’t dive from racing starting blocks without proper training and direct supervision from a qualified coach. Don’t dive at or through objects such as inner tubes.

Don’t swim or dive alone. Do so only with a “buddy” and preferably under qualified supervision.

Don’t drink or take drugs during or prior to participating in aquatic activities. The slowing effects of alcohol or drugs on reaction time can be extremely dangerous in diving.

Principles of Safe Sliding

Do not allow any slider to slide headfirst at any time. Allow only sitting slides.

Allow only one slider on the slide at a time. Clear the landing area before you allow the next slider.

Prohibit other people from using the water landing area in front of the slide.

Maintain a minimum water depth of five feet in the slide landing area.

Reducing Springboard Diving Accidents

The following recommendations minimize or eliminate springboard diving accidents. Unfortunately, there is no legislation in most states that mandates that the swimming pool industry follow these standards. The safest pool design provides a pool for springboard and platform diving, and a separate pool for swimming. Where this is not feasible, divide the diving area from the rest of the pool by a bouyed line.

A minimum water depth of 12 feet in the landing area is necessary for safe diving from competitive diving boards, which are usually 16 feet long, and placed either one or three meters above the water's surface.

Recreational diving boards (12 to 14-foot long) should have a landing area with a minimum water depth of ten feet. However, we still recommend the 12-foot minimum.

Extend the maximum of water immediately below the tip of the diving board forward for a distance of 16 feet before the bottom slopes upward.

Carry the maximum depth of water laterally ten feet on either side from the center line of the board.

Do not permit recreational divers to manipulate the adjustable fulcrum on springboards, unless they have been trained to do so. During recreational swimming periods, the adjustable fulcrum should be locked in a fixed position, preferably in its most forward position, in order to reduce the spring of the board.

Provide water surface agitators to provide greater visibility of the water's surface and help reduce the potential for injury.

Factors Contributing to Springboard Diving Accidents

The following are contributing factors of springboard diving accidents. By identifying the causes, facility managers can reduce or completely eliminate these factors.

Inadequate underwater and overhead lighting. This condition can prevent the diver from seeing the pool bottom.

Cloudiness (turbidity) of the water. This condition is usually caused by a chemical imbalance, or a faulty filter system.

Lack of any markings, lines, or targets on the pool's bottom fails to provide divers with a visual reference for judging the bottom's profile and water depth.

Glare on the water's surface, caused either by the sun or from lights which are improperly located.

Impaired vision of the diver, caused by the need to remove eye glasses before diving.

Recommendations for Open Water Areas

In addition to the recommendations and principles previously mentioned in this article, you should place

warning signs, lifeguards, and fencing at sites where the water depth is insufficient for diving, or where the bottom contains dangerous obstacles. Diving should be strictly prohibited in these areas.

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