

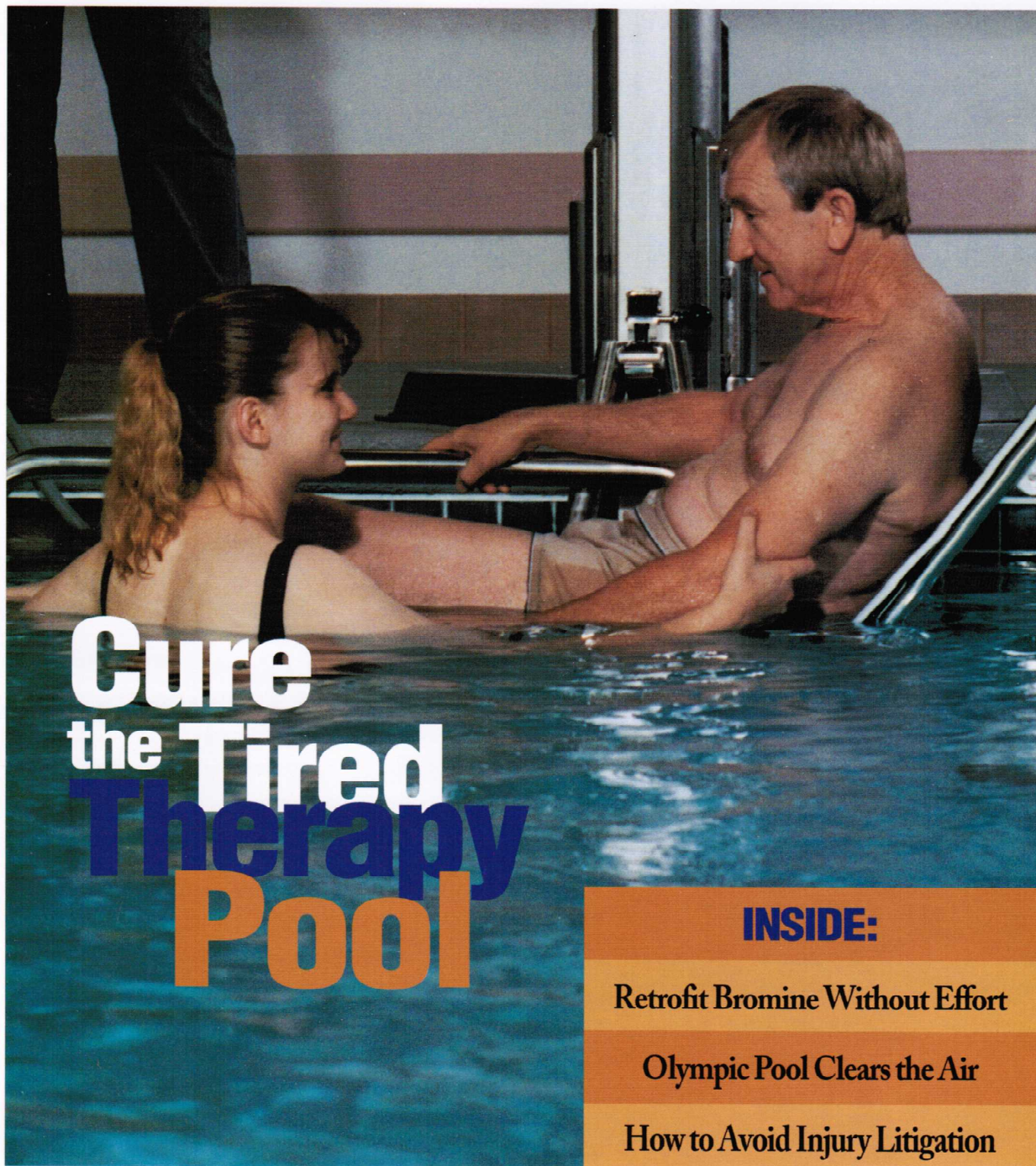
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# Drowning Misdiagnoses Can Be Costly



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**W**hen a death occurs and the victim is submerged, there is usually a presumption that death was due to drowning. The cause of death will be labeled as drowning unless an alternative anatomical cause or forensic evidence is uncovered which is inconsistent with drowning.

Experts, attorneys and, ultimately, juries must then determine whether the victim died as a result of ventricular fibrillation (heart spasms originating in the ventricles) and eventual cardiac arrest — common in freshwater drowning — or whether the victim had a heart attack in the pool and aspirated water coincidentally during a terminal gasp.

Not knowing which scenario occurred can be traumatic for the lifeguard, who has no way of knowing that there wasn't anything they could have done to save the life of a patron they were charged with protecting. Staff members unable to deal with their feelings may blame themselves, become withdrawn, lash out or turn to destructive behavior.

A misdiagnosed drowning can also be time-consuming and costly for an aquatic facility if litigation results over a death that wasn't caused by negligence on the part of pool employees. Declining revenues, loss of public confidence and costs associated with insurance claims, legal defense, settlements or awards can all unnecessarily harm the facility.

## Drowning

Active drowning may start with a surface struggle that typically lasts 10 to 20 seconds (hence the importance of scanning one's area of responsibility once every 10 seconds). Surface struggles are not always visible, but usually involve distinctive behavior that trained lifeguards can distinguish from any other non-drowning event.

Any surface struggle is followed by submersion and a 30- to 90-second period of involuntary breath-holding. The victim becomes unconscious and after approximately 60 seconds exhibits a brief 5- to 10-second seizure accompanied by jerking movements and sometimes frothing from the mouth.

The hypoxic convulsions occur as a result of anoxia — a lack of oxygen to the brain. In the majority of drownings, which are often described as "wet drownings," the victim then aspirates water. Clinical death begins as breathing and pulse stop. After the brain cells have been without oxygen for 4 to 6 minutes, irreversible brain damage or biological death occurs.

In freshwater drowning, water enters the lungs and is drawn through alveoli membranes into the blood because of the higher sodium content of the blood. Blood volume increases, and hemolysis, an explosion of red blood cells into the plasma, may occur, causing an oxygen transport problem.

Blood dilution within two or three minutes of osmotic transfer causes an electrolyte imbalance. The sodium, potassium, chloride and magnesium chemical imbalance leads to ventricular fibrillation. Ventricular fibrillation is fatal if it persists. The condition results in ineffectual or incomplete heart contractions, prevents effective cardiac output and

leads to cardiac arrest (heart stoppage).

Successful treatment requires basic life support and CPR within four minutes and prompt defibrillation within eight minutes. Unfortunately, the prognosis for resuscitation is poor if there is a prolonged period of inadequate coronary activity.

The survival rate for adult victims of non-traumatic-event cardiac arrest is very low, estimated at less than 5 percent. According to a 3-year study conducted in New York City, when CPR was done by a bystander, success rates were as low as 1.4 percent. When CPR was performed in a textbook manner following all recommended protocols, the survival rate increased to 4.6 percent.

## Cardiac Events

A victim is found face down in the pool. The autopsy report based on external and internal examination reveals:

- Pulmonary edema or fluid in the lungs. The lung tissue is heavy and fluid-filled, which is consistent with inhaling water or as a result of left-sided heart failure due to heart disease (heart has not been pumping sufficient blood out of the lungs.)
- Presence of white froth in the airway.
- Hydrothorax (bilateral pleural effusions) or clear watery fluid around the outside of the lungs which can be caused by congestive heart failure, disease or drowning, or as a result of injection of fluids during life-saving attempts.
- Hypoxia as a result of lack of oxygen due to asphyxia.
- A diffuse duskeness of the cerebral cortical ribbon consistent with anoxic change.

Death was due to asphyxia, a lack of oxygen to the tissues. The pathologic findings were consistent with drowning, but the cause and mechanism of death were unclear. Freshwater drowning was a possible (but not the only) cause of death. In cases such as these, extensive review of the evidence, medical histories and events leading up to the fatal event must be examined.

The prevalence of death in swimming pools from silent heart diseases such as interstitial myocarditis, dilated cardiomyopathy or coronary artery disease seems to have more to do with exercise or participation in active sports than being in a pool.

Victims of sudden death syndrome often die while participating in sports. Prior to starting an exercise program, the American Heart Association recommends a detailed physical examination which includes cardiovascular screening. Standard physical exams do not detect the majority of cardiac abnormalities or heart disease.

Unfortunately, a number of cardiac-related deaths occur every year in swimming pools. The individuals would be just as likely to die at home or elsewhere, but the incident just happened to occur in a pool. Some of these incidents will be misdiagnosed as drowning.

The frequency of misdiagnosis of the cause of death in swimming pools can be reduced in two ways. First, we must continue educating lifeguards in drowning recognition and the importance of uninterrupted supervision. Second, the medical community must continue their efforts to identify heart diseases that might cause fatal cardiac events.

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