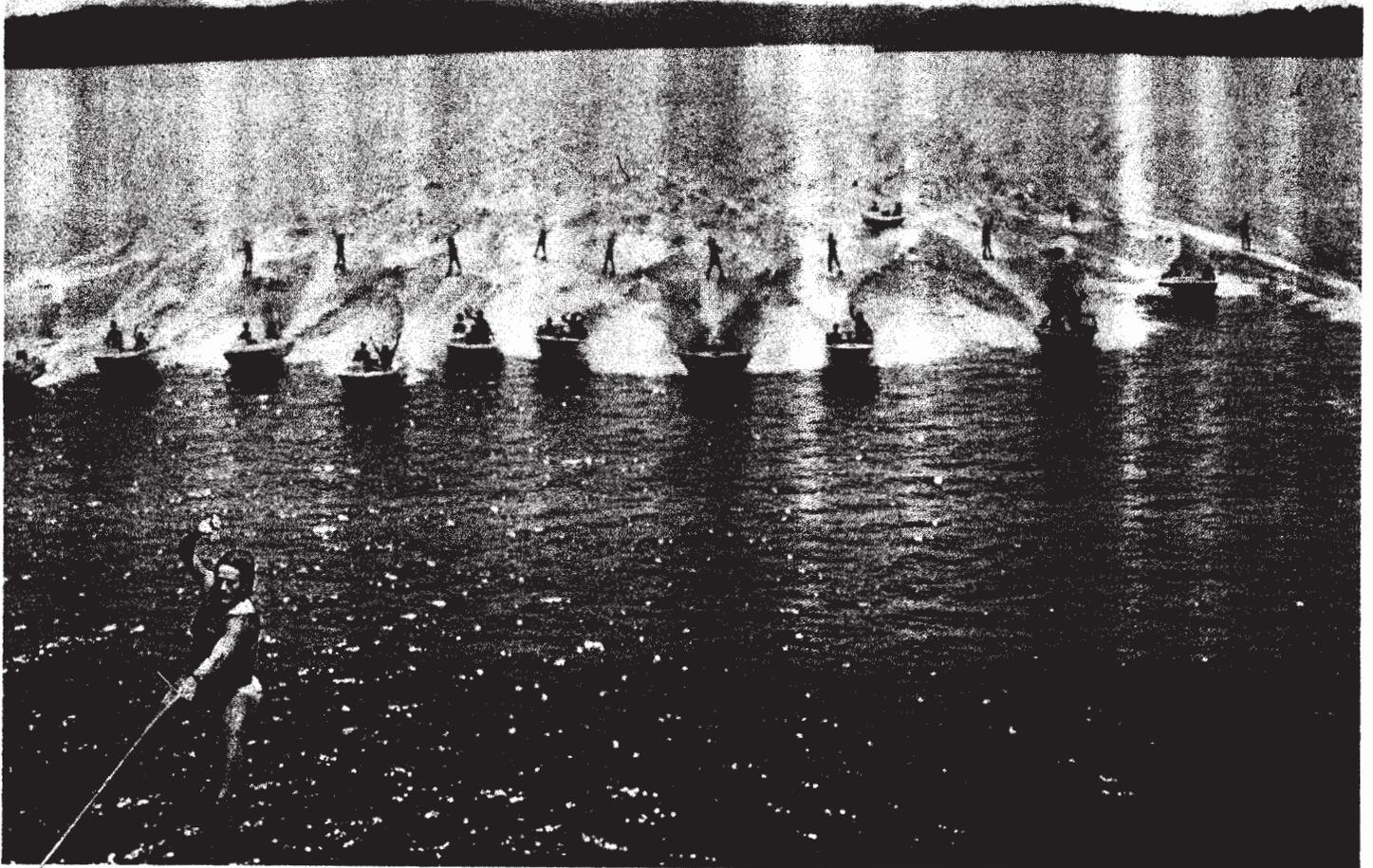




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THE COUNCIL FOR NATIONAL COOPERATION IN AQUATICS

DROWNING

Alison Osinski

An individual finds himself unexpectedly in the water. Unable to save himself because of lack of swimming ability or injury, and unable to summon assistance which should be readily and immediately available, he panics, struggles briefly on the surface of the water and then slips below.

After submerging, he holds his breath until no longer able. He eventually resigns himself to the fact that he is going to drown, and a sense of calm overtakes him. As he begins to lose consciousness from asphyxia, the reflex closure of his glottis is overcome by the need to breathe. He inhales a large quantity of water, then begins to vomit. The regurgitated water and vomit are aspirated into his lungs. As he begins to sink deeper in the pool, the increased water pressure on his chest forces the remaining air out of his lungs. The water now in his lungs passes into his bloodstream and dilutes the blood. As the salt concentration of his blood is lowered, the red blood cells begin to burst into the surrounding plasma and be destroyed. The hemolysis causes a frothy pink fluid to build up in his lungs and a tremendous swelling to take place. An electrolyte imbalance develops as calcium levels decrease because of the blood dilution, and potassium levels increase due to the break up of the red blood cells. As a result of this electrolyte imbalance and oxygen deprivation, his heart is forced into ventricular fibrillation. Within a short time, he is clinically dead.

He lies submerged in deep water for an undetermined amount of time, until eventually spotted. After being pulled from the water, he is positioned and checked for respiratory and cardiac arrest. Resuscitation attempts are hampered due to the lack of any sort of established and practice emergency action plan. The lifeguards do not have the knowledge, nor the training, to deal with this catastrophic emergency. Confused over the proper techniques, and unprepared for the physiological responses of the body to drowning, the guards are not able to apply the proper emergency first aid procedures. Biological death follows.

A number of acts on the part of the lifeguards on duty, and ultimately management, contributed to this drowning. The lifeguards failed in their duty to protect the victim from risk of harm. They did not give him the degree or standard of care owed by competent and trained professionals. And, they acted below the approved standard of care in their rescue attempts after being made aware of this situation.

Substantial factors contributing to this drowning may have included: lack of lifeguard training for the facility, lack of proper supervision, lack of proper surveillance techniques, distraction from surveillance duties, intrusion of non-guard duties upon the lifeguards, failure to recognize a drowning victim, water quality which inhibited the observation of a submerged victim, no established and practiced emergency action plan for drowning, and improper application of first aid techniques, particularly cardiopulmonary resuscitation.

This drowning occurred in a supervised pool with lifeguards on duty. This loss of life should never have

occurred, and never would have, had the lifeguards correctly performed their primary responsibilities.

Of the thousands of accidental drownings which occur annually in the United States, disturbingly, about ten percent follow this scenario, and take place in supervised areas with lifeguards on duty. Since a lifeguard's primary responsibility is to protect bathers from drowning and other water related injuries, the fact that a drowning occurs often shows dereliction of duty, and at a minimum, negligence on the part of the lifeguards charged with protecting bathers from harm.

Unfortunately, most trained and certified lifeguards do not know what a drowning victim looks like. They have not been exposed to an accurate description of causes of drowning, and are unaware of what happens physiologically and emotionally to a drowning victim. Often lifeguards are not familiar with the profile of individuals most at risk of becoming drowning victims. Many guards fail to recognize a drowning victim or see the drowning take place, because of their lack of training in this aspect of the job of lifeguarding, and because of their inattention to, or distraction from, their duty.

Profile of Drowning Victims

McCloy and Dodson (1980) questioned why people become fatalities while engaged in aquatic activities, and which groups were most at risk. Their findings showed that females tended to drown much less frequently than males in all age groups. When the 515 recreationally-related drownings reviewed in their study were broken down by type of water body, it was found the leading site for drownings was swimming pools, and 48% of those pool drownings happened in apartment complex pools.

Deitz and Baker, in their 1974 study of drownings, found "the dead man's float is a phenomenon peculiar to those who are alive and those who have been dead long enough for putrefactive gas formation to have raised the body to the surface." Lack of supervision was an important factor in drownings. Unattended and unsupervised children found their way into swimming pools. 75% of drownings studied were witnessed by persons old enough to have saved the victims through use of lifesaving and resuscitation techniques.

The Council for National Cooperation in Aquatics (CNCA) has reviewed data on drowning for several years, and has consistently found that approximately 85% of drowning victims are male, 1/5th of all drownings happen in the peak month of July, about 40% occur on Saturdays and Sundays, about two thirds occur in the afternoon and early evening, and about two thirds of victims do not know how to swim. The most frequent proximate cause of drowning is unintentional falling or slipping into the water. Lack of adult supervision is another important factor.

Smith (1984) has presented the most up to date statistics on drowning. Two thirds of aquatic accident victims can't swim. Two thirds of victims had no intention of entering deep water. In 1979, 850 of the 7000 drownings that occurred in the U.S. were to children between the ages of 5 and 14 years old. Most drownings occur

10 to 30 feet from safety.

Recognition of a Drowning Victim

First, a distinction should be made between a distress victim, and a drowning victim. A distress victim is one who is unable to get to safety without some sort of assistance. He/she may have some swimming skills, but cannot make forward progress toward safety. A distress victim is able to breathe and may be able to wave or call for help. The victim's buoyancy alternates between neutral and positive. The average person when suspended motionless in water will submerge to about eye level in a vertical position. They will make lifting motions in an attempt to swim and to raise themselves above the surface of the water, but only up and down movement and little or no forward progress will result. A distress victim may become panicky and pass in to being an actively drowning victim if assistance is not rendered.

There are two types of drowning victims. Passive victims and active victims.

Passive victims are those who experience a sudden loss of consciousness while in the water. For example, those who suffer a heart attack, sudden cold water immersion, stroke, collision resulting in injury to the head, or epileptic seizure while in the water can become passive drowning victims. They make no attempt to get attention, may float face down on the surface or may slip below the water surface without warning.

Active victims are rarely able to call out for help since their primary concern is breathing. Most lapse into instinctive involuntary arm movements which are designed to bring the victim's head up and above water. Arms are extended out at the sides and push down on the water. The mouth is open and tilted backward to increase air intake. The victim can't see, hear, or react to instructions. Usually the victim manages to turn toward safety or shore. The body is in a vertical rather than horizontal position in the water. The victim gradually and continually sinks lower and lower in the water, as he passes from neutral to negative buoyancy. Immediately before submerging completely below the surface of the water, the victim's hands are seen grasping towards the surface. After a brief struggle, a drowning victim will be seen lying motionless underwater. This sequence of drowning usually occurs within 20-60 seconds of entering deep water.

Frank Pia, chief lifeguard for Orchard Beach, Long Island, and well known aquatic expert, has filmed actual drowning and distress victims as they struggled off Orchard Beach. The film, "On Drowning" is the result of his efforts. To corroborate the filmed evidence of drowning behavior, Frank Pia has performed drowning experiments with himself as victim. He tied his legs together, wore a 20 pound weight belt, had a line tied around his chest and attached to his assistant standing on the pool deck. After 40 seconds of immersion, he exhibited typical drowning responses. He panicked, he struggled involuntarily, his respiration and heart rate increased, his arms flailed in and out of the water in unison, he bobbed vertically, his head tilted backward with mouth in the universal sign of drowning, and he was not able to call for help.

Physiological Responses To Drowning

Drowning is a type of asphyxia related to either aspiration of fluids or obstruction of the airway caused by a spasm of the larynx.

In salt water submersions, the high concentration of salt in the water which has been ingested causes fluid from the bloodstream to pass into and flood the lungs. A sudden fall in blood pressure will result in circulatory collapse, shock, and death.

In 90% of fresh water submersion cases, carbon dioxide builds up as the victim holds his breath, the larynx relaxes, water is swallowed, regurgitation occurs, and water and vomit enter the lungs. Water inhaled into the victim's lungs is absorbed within two to three minutes into the bloodstream and dilutes the blood. Blood volume increases. Red blood cells are destroyed as the salt concentration of the blood lowers. Oxygenated blood cannot get to the brain. Hypoxia and brain damage occur. The pupils dilate. Conscious struggling stops; convulsions and twitching begin. The lungs may be empty, but more commonly swelling occurs and a frothy pink fluid builds up in the lungs as a result of hemolysis, the rupturing of the red blood cells. Hemodilution causes an electrolyte imbalance. Calcium levels decrease and potassium levels increase. Ventricular fibrillation and clinical death follow.

In the other 10% of drownings, dry drowning occurs. Laryngospasm, the automatic blockage of the breathing passages, occurs. Little or no water enters the lungs. Breathing stops and death is the result of asphyxiation. These victims are usually found floating face down on the surface.

Jokl (1968) has done medical research into the causes of death from drowning and has found that:

"inhalation of fresh water establishes an osmotic pressure gradient in the opposite direction: and water is drawn into the circulation so rapidly that the blood may suffer a 50% dilution within two or three minutes. This results in another osmotic gradient across the red cell membrane; and as water flows into the red cells they burst asunder and release their contents into the plasma. The heart is then submitted to hypoxia, over-filling, potassium excess, and sodium deficit. It would be hard to think of a more certain way of producing ventricular fibrillation, and it is this that causes death."

Jokl (1968) has also recommended first aid treatment for drowning. Water is not inhaled until anoxia overwhelms the protective mechanism of reflex glottis closure.

"During this period, which may last for several minutes, the state is one simply of asphyxia; and there is a good chance of recovery either spontaneously or as a result of artificial respiration."

"Attempts at drainage only waste time. . . no significant amount of fresh water will be discharged from the lungs."

"... application of closed-chest cardiac compression might result in some oxygen getting to the brain if concomitant artificial respiration could force it, despite the intervening fluid, into the pulmonary blood."

Redding, et al. in their 1961 dog drowning studies found that flooding the lungs with fresh water after asphyxia resulted in relaxation of the glottis, sudden ventricular fibrillation, hemodilution, hypervolemia, and hemolysis. They also found "when breathing movements are absent, efforts to remove water from the lungs results only in wasted time."

The literature has shown that first aid treatment for

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Drowning (continued from page 7)

drowning consists of the immediate application of artificial respiration accompanied by external cardiac compression. Survival of the victim depends on the fitness level of the individual, the duration of the submersion, the amount of water inhaled, and the speed of treatment.

Psychological Response To Drowning

The degree of psychological distress experienced varies from victim to victim depending on the type of drowning involved, the length of submersion, and the mental awareness of the victim to the struggle. Of course, only those who have survived near-drownings, or those who drowned but were later revived have been able to describe the pain and suffering they experienced, their emotional state and what they were thinking while they were drowning. Although a drowning victim has a somewhat distorted view of reality, a common story has emerged in interviews with persons who experienced drownings and lived to tell about it.

Nemiroff's (1980) retrospective interviews with persons who survived near drowning reveals that after a very brief panic filled struggle while submerged, victims were overtaken by a "pleasant, hazy, floating, blue sensation. They were calm, and in some sense found it a pleasurable sensation." In an interview with a young man who drove his car off the road into a pond, Nemiroff reports that the young man held his breath as long as he could, was forced to inhale water, felt the water burn deep in this chest, struggled briefly then became resigned to the fact that he was going to drown and die. He just let the events unfold. He felt a very hazy blue feeling and he had a sexual orgasm. The next thing he remembered was waking up in ICU.

Way (1983) has also reported the experiences of drowned victims. They have reported slipping below the surface after a very brief struggle and sinking to the bottom. A pleasant, hazy, floating, blue sensation like a narcotic high was felt. This frequently reported sensation may be due to a morphine like chemical substance released by the brain. Several victims described "out of body experiences" and said they were subconsciously aware of what was going on during resuscitation attempts.

Tyhurst (1974) describes a drowning victim as one who experiences high levels of anxiety which result in extreme panic immediately before loss of consciousness. The victim sees no solution to the problem, his vigilance is increased, he concentrates and focuses his attention around the threat. Fear is experienced and tension levels increase. Heart rate and breathing increase, and body temperature rises. Anxiety is accompanied by a feeling of hopelessness and a demonstration of purposeless activity.

In the 1962 CNCA revived victims survey, drowning victims described their feelings or actions of near drowning. Although varied and often contradictory, frequently mentioned were that it felt: like a bad dream, like I was unable to move, that there was nothing I could do, like sinking, dark, like I couldn't get air, great—like nitrogen narcosis. All those who answered the question said they passed out before being pulled from the water.

It is important to remember that all near drowning victims would have been drowning victims, if someone, or something had not interrupted the drowning se-

quence. As Smith (1980) has said, "People don't accidentally die in the water. Rather through their own or someone else's carelessness or stupidity, they manage to kill themselves".

References

- CNCA. (1962). [Revised water case study]. Unpublished raw data.
- Dietz, P.E. & Baker, S.P. (1974). Drowning: epidemiology and prevention. *American Journal of Public Health*, 64, 303-312.
- Edmonds, J.F. (1978). Drowning. In J. Palm (Ed.), *Aquatic emergency care* (pp. 7-8). Toronto, Ontario, Canada: Royal Life Saving Society Canada.
- Jokl, E. (1968). Sudden non-traumatic death associated with physical exertion with special reference to drowning. In S. Firsov & E. Jokl (Ed.), *Medical Research on Swimming* (pp. 235-249). New York: All American Productions.
- McCloy, J.M. & Dodson, J.A. (1980). Water-related fatalities in coastal Texas, 1970-78. In *Aquatics in the 80's*, a report of the 21st conference of the Council For National Cooperation in Aquatics (pp. 7-17). Atlanta, GA: CNCA.
- Meslin, J. (1960, February). What do you do when you're faced with the menace of drowning? *Swimming Pool Age*, p.15.
- Nemiroff, M.J. (1978, June). *Cold water drowning: a new lease on life*. Ann Arbor, MI: USCG and the Michigan Sea Grant Program.

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CNCA'S 35TH ANNIVERSARY

COUNCILMAN AND deVARONA TO BE FEATURED SPEAKERS



The conference in Indianapolis this November marks the 35th anniversary of CNCA; 35 years of cooperation between more than 30 national organizations, in efforts to better aquatic education. The 1986 conference program is an exciting one, with all-time greats James "Doc" Councilman and Donna deVarona, researchers David Costill, Marlene Adrian, and Steve Langendorf, two Olympic coaches, and more than 40 other fine aquatics professionals speaking. Topics on legal liability and risk management, research, water parks management, aquatic administration, medical related issues, and many aspects of instruction and program will be presented.

Exhibitors will be there with product information, publishers with new books, and conference activities will provide unparalleled opportunities in idea exchange and information gathering.

There will be a program exchange: a "Drop-in Center" where individual professionals will have opportunity to show their own program materials and promotional information, and exchange program ideas with others on an individual basis.

There will be meetings of allied groups (American Red Cross, Boy's Clubs, Boy Scouts, etc.), tours of the natatorium and other world class sports facilities in Indianapolis — the amateur sports center of the U.S. A Certified Pool Operator's course will be offered in conjunction with the conference.

Review the conference schedule, opposite, and see why YOU CAN'T AFFORD TO MISS:

AQUATICS—A CHANGING PROFESSION

CNCA is an umbrella organization for over thirty (30) national agencies and organizations that have strong interest and involvement in aquatics. The types of involvement, and the organizations themselves, vary greatly. In an effort to help all of our readers better understand both CNCA and its members agencies, we will feature one or more of our members in each issue of the National Aquatics Journal.

INTERNATIONAL ACADEMY OF AQUATIC ART

The International Academy of Aquatic Art, formed in 1955, is a non-profit organization for the development of swimming as a performing art. Persons interested in swimming as an artistic, creative, non-competitive activity are eligible for consideration as members of the IAAA.

The objectives of the organization, as stated in its articles of incorporation, are:

"To recognize and explore the potential of the aquatic medium for truly artistic self-expression and interpretation:

"To establish an academic environment conducive to the full development of aquatic art forms:

"To interest people in participating in the development of aquatic art."

Area Aquatic Art Symposia and an annual International Festival sponsored by the IAAA stress the importance of basic techniques in figures, support scull, strokes, muscular control, body position and breath control, in instructional workshop sessions. Lectures and demonstrations by experts in various topics related to aquatic creativity are also included. Such topics would include dance expression, choreography, music interpretation, and sources of artistic expression such as drama, folklore, etc.

The International Festival is held once each year, giving participants an opportunity to present their compositions for evaluation and award. The festival provides opportunity for the public to enjoy the artistic performances. The IAAA believes that aquatic art and creative expression provide life-long benefits.

The IAAA representative on the CNCA Board of Directors is Jill White, of Sarasota, Florida.



NATIONAL FORUM FOR ADVANCEMENT OF AQUATICS

The National Forum for the Advancement of Aquatics was founded in 1937, as the Women's National Aquatic Forum. The Forum has always functioned as a completely volunteer organization: no one is paid for services rendered, nor are speakers fees or expenses awarded. The Forum is recognized as a common meeting ground for all those professionally involved in aquatics.

The Forum meets every year, from December 26 to December 31. It is an annual gathering of aquatic enthusiasts, including college professors, high school teachers and coaches, and aquatic professionals who work in agency settings and public facilities. The aquatic interests represented are broad, and include swimming, diving, scuba, adapted aquatics, synchronized swimming, sailing, boating, etc.

Interests range from basic techniques to research. The relaxed atmosphere is conducive to informal sharing of ideas and exchange of information. The program is structured so that there is some time for fun in the sun. The NFAA is one of the oldest organizations in the country devoted to the demonstration and application of techniques in all phases of aquatics. The organization sponsors research and grants student scholarships. Its primary purpose, however, is to provide a combined professional/holiday experience in Florida.

The NFAA invites you to combine your Christmas holiday with Florida sunshine in a unique opportunity for professional development in a relaxed atmosphere. Chair of the Forum (1985-86) is:

Bea Pyle
119 N. Campus Ave.
Oxford, OH 45056

Adele McCloskey represents the NFAA on the CNCA Board of Directors.



Drowning (References) (continued from page 10)

Nemiroff, M.J. (1980). Survival following cold water near drowning. In *Aquatics in the 80's*, a report of the 21st conference of the Council for National Cooperation in Aquatics (pp. 41-46). Atlanta, GA: CNCA.

Pia, F. (1984, June). The RID factor as cause of drowning. *Parks & Recreation*, pp. 52-58, 67.

Redding, J.S., Cozine, R.A., Voigt, G.C., & Safar, P. (1961). Resuscitation from drowning. *The Journal of the American Medical Association*, 178, 1136-1139.

Smith, D.S. (1980, August). New lifesaving facts about water safety. *Family Circle*, p. 50.

Smith, D.S. & Smith, S.J. (1984). *Water wise*. Imperial, MO: Authors.

Tyhurst, J.S. (1974). Persons under stress. In J. Palm (Ed.), *Alert: aquatic supervision in action* (pp. 54-55). Toronto, Ontario, Canada: Royal Life Saving Society Canada.

Way, G.H. (1983, Spring). Cold water near drowning. *Alaska Fish Tales & Game Trails*, pp. 8-11.