Water Rescue Sequence

The Controversial Role of the Heimlich Maneuver

By
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Drowning is the third most common cause of accidental death for adults. For children, water is even more deadly—it is their second largest accidental killer, although in some areas it can rank as high as number one. Death is not the only consequence of course. Countless others survive a prolonged submersion but are left with varying degrees of neurological impairment and altered lives.

But if all are in agreement as to the anguish submersions inflict, there is sharp disagreement within the rescue and medical communities when it comes to the matter of resuscitation. The controversy centers on the Heimlich maneuver, used for years to assist choking victims, and the position it should occupy in the rescue sequence. Should it be automatically administered as a first response, followed by CPR if necessary; or should it be used only if a solid object, such as food, appears to be blocking attempts at ventilation? This debate is extremely important to waterparks and facilities eager to ensure guest safety and to establish appropriate resuscitation procedures.

The following article is the result of months of research and interviews with leading medical authorities and front-line rescue personnel. I have tried to let the evidence speak for itself. It is up to park owners to examine their own protocols and if necessary, to ask some hard questions.

"Almost everything I have ever developed has initially been objected to," Henry J. Heimlich, M.D.

Dr. Heimlich is no stranger to opposition. For most of his career, he says speaking by phone from his Heimlich Institute headquarters in Cincinnati, Ohio, resistance to his medical discoveries has been the norm rather than the exception. He tells me this not with an air of persecution but matter-of-factly. As he often says by way of explanation, "If all of your peers understand what you have done, you haven't been creative."

Although Heimlich developed other procedures and products still used today, he is best known for the Heimlich maneuver for choking, which he began working on in conjunction with Edward Patrick, M.D., in the early 70s. Prior to Heimlich's and Patrick's work the remedy taught by the Red Cross since 1933 was backslaps. However, Heimlich believed this response was incorrect and that backslaps only lodged a foreign object more tightly in the airway (trachea). According to Heimlich, his and Patrick's experiments demonstrated the maneuver delivered seven times more the kinetic energy to a foreign body than a backslap and was therefore a more effective response.

Heimlich went public with their results in 1974 and started hearing from people claiming they had been saved by the maneuver. But the medical community resisted, saying the anecdotal evidence collected at that point did not constitute enough scientific proof to warrant a change of procedure. According to Victor Esch, M.D. who attended the National Academy of Science meeting where Heimlich tried to present his results for the first time, the response from those at the meeting was "unbelievable."

"You just couldn't imagine educated people behaving that way," the retired surgeon and former chief surgeon of the Washington, D.C. fire and police departments recalls. Speaking to me from his Potomac, Maryland home, it's clear the memory still pains him. "They simply would not let Henry complete his presentation."

Heimlich walked off the stage past Esch who had also planned to present evidence in favor of the maneuver, only in his case it involved a near drowning incident. In August 1974, Esch, while on vacation at the beach, happened upon an unconscious swimmer being pulled out of the water by a lifeguard. "I don't know what this guy ate before he went swimming, but vomit was everywhere," Esch says. "There was just no way you could have done CPR on this person."

Esch was familiar with the maneuver, having met Heimlich a few months earlier. He had come away from that meeting thinking the maneuver worked so well for choking that even then he thought it might also work for drowning in the case of a blocked airway. When he saw this particular victim, Esch decided to give it a try. After delivering several thrusts, which he says cleared the airway of vomit, the man began breathing, albeit irregularly, on his own.

This is what he was prepared to tell those at the meeting. But when he saw Heimlich's reception Esch decided to leave instead.

Heimlich and Patrick continued to gather evidence in favor of the maneuver. Patrick went on national talk shows and asked listeners who had experienced a choking incident to contact him. He received over 3,000 responses. After qualifying the responses, he ended up with about 1,400 cases. He sent a questionnaire to these people, asking them to recall specifics about the choking and what remedy was given. Patrick then applied outcome analysis (which he claims is a way of evaluating treatment and predicting future outcomes based on what treatment is given) to the data he complied from their responses. He concluded the probability of a bad outcome (victim becomes unconscious or dies) was nearly four times higher if backslaps were used, even in conjunction with the maneuver.

In spite of this, says Heimlich, the American Heart Association (AHA) the American Red Cross (ARC) and other public health officials refused to accept the maneuver but continued to teach backslaps. Heimlich says it was not until then U.S. Surgeon General C. Everett Koop came out in 1985 and endorsed the maneuver as the only method that should be used for choking that the maneuver was finally accepted—almost 10 years after Heimlich introduced it (the AHA denies this, saying it was the review process which led to this delay and that Koop was actually following *their* recommendations).

And now, says Heimlich, the same thing is happening again when it comes to drowning.

"CPR for drowning, without first draining the water from the lungs, is a deadly error. The American Heart Association and the American Red Cross are responsible for thousands of needless deaths by teaching CPR for drowning," Heimlich.

Heimlich contends that in almost 90% of all submersions the victim inhales enough water to "fill the lungs." He also says it is impossible to get air into lungs that are filled with water. He claims the maneuver "clears all water from the lungs", even from the alveoli (microscopic air sacs within the lungs). He advises the maneuver be immediately administered (lifeguards can do this while still in the water) until "no more fluid flows from the mouth," after which ventilation can be given if necessary, although Heimlich says that often people begin breathing on their own and nothing more is needed.

The AHA and ARC do incorporate the maneuver into their rescue sequence. However, they say it should be used only if something solid appears to be blocking attempts at rescue breathing. It is a position

Heimlich finds unconscionable. He cites his own research of over 400 articles on drowning, "Every study," he says, "showed CPR was only beneficial after water was drained from the lungs." Heimlich goes on to declare there is no scientific evidence that demonstrates air can get into water-filled lungs. "Ask the Heart Association or the Red Cross to show you such a study," he challenges. "They cannot do it. No such study exists."

Furthermore, he continues, CPR results in an "extremely high death rate," especially where it involves children. Heimlich tells me that when children were pulled from public pools by ARC trained lifeguards who administered only CPR, *42% of them died*. "This death rate proves," he says, "the lungs are not cleared of water by CPR."

Heimlich uses a straw, inserted into a container of water, to illustrate the difficulty of trying to ventilate through fluid. Once inserted, water fills the straw to the same level that it fills the container. Placing a finger over the exposed end of the straw, he pulls it out from the container. The water remains in the straw because of atmospheric pressure and surface tension he explains. Blowing into the open end of the straw, through the water, causes only a slight movement (the way mouth-to-mouth given to someone with water in their airway causes the chest to rise) but no air reaches the finger. Heimlich states the straw mimics the lungs and demonstrates that air cannot pass through water.

"Doing the maneuver first takes only seconds and anybody can learn to do it," Heimlich says. "CPR is very complicated, dangerous, and causes severe injuries and deaths; whereas the maneuver is safe, effective, and easy to learn."

Heimlich believes the AHA and the ARC remain so opposed to using the maneuver first partially over liability concerns. If they changed their protocol they would have to explain "why they have been doing the wrong thing for over 30 years and using something that has no scientific basis.

"I just can't stand it any more," he says, referring to their opposition. "I've given them a chance to accept this on a scientific basis and to stop fooling around, but with these children dying I've decided the truth has to come out. Everybody must be told that the same maneuver that you know works for choking works on drowning victims."

"The beauty of CPR is that only gives victims the amount of assistance they need," Mary Fran Hazinski, AHA.

Hazinski has been with the AHA since 1988. She has over 25 years of experience as a pediatric critical care nurse. She is the immediate past chair of the Emergency Cardiovascular Care Committee (ECC) of the AHA and is a senior science co-editor for the ECC within the AHA. Hazinski currently works at Vanderbilt Hospital in Nashville, Tennessee, as an injury prevention specialist.

The ECC reviews the scientific literature to see if changes need to be made to AHA guidelines. It is these guidelines that the ARC and others follow when putting together their resuscitation education and training programs. The ARC does not make protocol decisions on their own but develops their resuscitation programs solely in accordance with AHA guidelines. For the ARC, the Heimlich/CPR controversy is "pretty much a non-issue," says Connie Harvey, a Red Cross safety expert based in Washington, D.C. "We have the guidelines and we know these have been reviewed, approved, and recommended by the consensus of medical opinion. We do not change our programs unless the ECC guidelines are changed."

Hazinski regards Heimlich's crusade as a non-issue as well, though it is still annoying. Every year, usually around summer, she tells me, the AHA and the ARC have to field a spate of media calls about this

so-called controversy. But the bottom line is, she states, there is no medical evidence that supports the use of the maneuver as the first thing to use on a drowning victim.

"Most researchers don't believe that a substantial amount of water enters the lungs, unless the person has been underwater for a prolonged period of time," Hazinski states. What prevents this is called a laryngospasm. This happens when a foreign object, such as food or water, passes the vocal cords causing the larynx to spasm and close off. "Have you ever taken a drink and had it go down the wrong pipe, and you can't breath?" she asks. "This is what happens in a drowning when the person inhales and water goes down the airway. The larynx closes off to keep the water out."

Research also shows that water does not act as a solid block that needs to be removed, meaning that it is possible to get air into the lungs even if some amount of water is present, she states. Consequently, it makes little sense to delay ventilation, even for a few seconds, by doing the maneuver first, especially since there is no indication it can expel water from the lungs in the first place.

Hazinski also describes Heimlich's use of a straw to depict how water impacts the upper airways as misleading. Water does not remain in the trachea and the lungs but is instead absorbed, she says. "A sponge would be a more accurate illustration than a plastic straw."

And although there can be complications with CPR, Hazinski continues, the maneuver is hardly an innocuous procedure. "It can be extremely traumatic to the body. And while victims do vomit during CPR, there is a greater likelihood of this happening because of the maneuver, and a greater chance of aspirating stomach contents into the lungs."

The AHA's approach is an "orderly progression of assessment and support" that takes just seconds to do and gives victims only the amount of assistance they need, Hazinski says. The short version is: tap the victim and shout to check their responsiveness; open the airway; look, listen, and feel; give two breaths; if breaths do not go in, reposition head and try two more; if breaths do not go in do the maneuver; check for pulse and other signs of responsiveness; if not responsive and no pulse do chest compressions.

"Many victims who are just briefly submerged respond to simple stimulation, such as tapping or shouting, which is often all they need to start breathing on their own, Hazinski explains. "To increase the risks of complications associated with the maneuver by automatically giving abdominal thrusts for no reason is worrisome."

I asked both Heimlich and Hazinski to send me information supporting their positions. The entire cycle of explanation and rebuttal generated between Heimlich and the authors is too lengthy to present here in their entirety, but following are the key points of the debate.

"Dr. Heimlich makes an assumption that has no basis in fact," Linda Quan, M.D.

Heimlich sent me a study done by Quan and highlighted the section from which he derived his 42% fatality rate for children pulled from public pools and given (according to Heimlich's materials) CPR by ARC-trained lifeguards. The study supplying Heimlich with his death rate appeared in a June 1989 issue of Pediatrics. It was titled 'Ten-Year Study of Pediatric Drownings and Near-Drownings in King County, Washington: Lessons in Injury Prevention'. It covered submersion events that occurred in this area from 1974 to 1983.

Heimlich appeared to have taken data from Quan's regional study and applied it universally. There was also no mention in her study that these guards had received CPR training from anyone. In fact, further down in this study Quan advised that these guards receive this training.

Currently, Quan is an associate professor in the department of pediatrics at the University of Washington School of Medicine. She is also chief of emergency services at Children's Hospital and Regional Medical Center in Seattle, and is internationally known for her work in pediatric drowning.

This study's purpose was to examine how children in this area were drowning and to make recommendations on preventative strategies. The researchers looked at a variety of situations, such as fencing, alcohol consumption, and child abuse; and environments such as lakes, rivers, bathtubs, and pools.

When it came to semi-public and public pools there *was* a death rate of 42% for children pulled from these pools by lifeguards. But Quan says that in many cases these were guards in the loosest sense of the word. They also sold tickets and hot dogs, they manned the locker rooms, and they were *not* CPR-trained, she states. "Cardiopulmonary resuscitation training and competency is not required for lifeguarding but should be," she wrote in the study.

Quan also stated in this study that the high mortality rate, "…reflects on the ability of the lifeguard to recognize, rescue, and resuscitate the drowning child." These factors, Quan tells me, contributed to the high mortality rate, and are why she advised formal training and tightening up the standards for lifeguards. Heimlich, she continues, incorrectly lays the blame on CPR, something Quan has expressed to him several times.

A later study by Quan demonstrated that an increase in the number and percent of CPR-trained lifeguards were among the factors associated with a decrease in the number of drownings and near-drownings in this area. "But Dr. Heimlich never mentions this study," she says.

"Of course I would not extrapolate (Quan's death rate) to the world results without confirming evidence," Heimlich tells me. "It is stated in my chapter, Scientific Facts Show Heimlich Maneuver Best Method For Drowning (appearing in Drowning: New Perspectives on Prevention, published by CRC Press in 1999) that the studies were conducted in the Seattle area." And he says he indicates this in his correspondence too, which is only inconsistently the case. He often fails to state the regional nature of this study, and almost as frequently, incorrectly identifies these as guards trained by the ARC in CPR.

He also says in this chapter the, "Lifeguards in this study were *not permitted* to use the Heimlich maneuver, only CPR." He seems to be misstating the situation, especially since during the period of time covered by Quan's study the maneuver for drowning was not even an issue for rescue personnel.

Quan and Heimlich also disagree when it comes to the issue of water in the lungs. Heimlich quotes a report by Quan that appeared in Annals of Emergency Medicine. In this she says when it comes to a submersion, the critical factor is time. Experiencing about four to five minutes of anoxia (inadequate oxygen supply) is about the limit one can tolerate with any hope of a "good neurological outcome." And, she notes, once you get them out of the water, victims "may suffer additional hypoxic (inadequate oxygen supply in the blood and lungs) injury." Therefore, ventilating as quickly as possible is essential.

Heimlich interprets Quan's comments thusly. "This means that water in the lungs even after the drowning victim is on shore is equivalent to the victim being submerged underwater. Water must be removed from the lungs as soon as possible to enable oxygenation."

"Heimlich makes an incredible jump from it is important to ventilate the victim as quickly as possible to water has to be removed," Quan says. "This is a nonsequitur that makes sense if you don't know any physiology of the lungs and the effect of ventilation. Water does not act like a foreign body; it does not

preclude the usual ventilatory techniques. And," she adds, "there is almost no such thing as a lung filled with water.

"There is also nothing to show that water just sits in the trachea," she continues. "He creates this idea with his cartoon drawing of a straw with his finger at the end of it. The trachea is attached to the lung! It is not the closed box he draws! In the operating room, pulmonologists routinely instill fluid into the bronchi for various reasons. It doesn't just sit there." And fresh water is very rapidly absorbed from the lungs into the bloodstream, as long as the heart is beating, she says.

"Restoring ventilation is the most important concern," Quan concludes. "Fortunately, most victims will resume breathing with only a little encouragement, which explains why sometimes the Heimlich seems to work."

"Dr. Safar misinterprets his own study," Heimlich

Heimlich and Hazinski both sent me the same abstract entitled: No Improvement in Pulmonary Status by Gravity Drainage or Abdominal Thrusts After Sea Water Near-Drowning. This abstract, which appeared in a September 1982 issue of Anesthesiology, presented findings from a study done on three groups of dogs that, under anesthesia, had artificial seawater instilled into their lungs. Group one was drained passively, with a tracheal tube held horizontal, group two was drained in a 30º head-down position (gravity drainage) for 10 minutes, and group three was placed horizontal and given four abdominal thrusts over a period of 60 seconds. The amount of fluid expelled was then measured.

The researchers concluded that, "The amount of water drained at one minute was significantly greater in groups two and three than in group one." Heimlich says this shows the maneuver was able to expel more water from the lungs than passive drainage.

I contacted Peter Safar, M.D., one of the co-authors on this study. Dr. Safar, who founded the Safar Center for Resuscitation Research at the University of Pittsburgh, Pennsylvania, has been involved in resuscitation research since the late 1950s when he demonstrated his theories about CPR—which had at that point been highly contested. At the time, the preferred method of ventilating a non-breathing person was through chest-pressure and arm-lift. Safar used medical students (whom he sedated and temporarily paralyzed with curare to simulate a non-breathing victim) tilted their heads back to open the air passage, and gave them mouth-to-mouth. His experiment marked the beginnings of modern CPR.

I also spoke with another co-author, Nicholas Bircher, M.D., an anesthesiologist and critical needs specialist at the same university. Bircher is also an associate director at the Safar Center.

Both Safar and Bircher confirmed that at one minute, the least amount of fluid was drained from the horizontal (passive) group, but they also pointed out there were no significant differences between the gravity drainage and the abdominal thrust groups. "This means abdominal thrusts were no more effective than gravity drainage at expelling water," Bircher explains. And by 10 minutes the total amount of fluid expelled by all three groups was equivalent, he adds.

Yes, it could mean, he says when I ask, that if a victim is on a flat surface, abdominal thrusts could expel more fluid than doing nothing. But what is most important to keep in mind, Bircher continues, is that in spite of a temporary, severe decrease of blood oxygen, there were no significant between-groups differences when it came to oxygenation, and no dogs in *any* group experienced cardiac arrest.

This study led the researchers to conclude, “It appears that passive horizontal drainage during emergency resuscitation is sufficient, and that thereafter intensive respiratory therapy is what determines oxygenation more than initial fluid drainage.”

Heimlich says their conclusion is “fraudulent”. “What kind of cover-up is this? If you are drowning do you want to use four Heimlich maneuvers and immediately empty the lungs of water, or do you want to lie around for 10 minutes until the water drains from the lungs?” he asks. (The lungs were not “emptied” of fluid in any group).

But Safar explains that water does not act as a block to ventilation, and that it is important to ventilate as quickly as possible before the heart stops. “We know that in many submersions the larynx will close and so water in many cases is not an issue. If the heart is beating and it is fresh water this will be absorbed by circulation. If seawater gets into the lungs, even a small amount can cause pulmonary edema, which is like a foam. This will not come out with a Heimlich maneuver. In these cases you need advance life support. You need to ventilate very quickly with oxygen, because in normal warm water situation brain damage can occur rapidly.”

What concerns him about the maneuver is that drowning victims often swallow a lot of water. “They can have a stomach full of water, which the maneuver can cause to be expelled. This can result in the aspiration of stomach contents into the lungs, which can cause severe complications,” Safar states. “And taking time to expel fluid from the stomach just delays ventilation.”

“Dr. Heimlich will not be happy until the world adopts his maneuver, but it is not the panacea for every situation,” Jerome Modell, M.D.

I had asked Heimlich to send me studies showing that water fills the lungs of drowning victims. Along with his chapter, he sent me the first page of a review article by Dr. Modell, entitled Drowning. Heimlich highlighted a section on that page in which Modell says that, “…approximately 90% (of drowning victims) aspirate fluid.” But nowhere on this page is any reference to how much water was inhaled.

In his chapter, Heimlich quotes the above line and follows it with another from Modell’s study, “…active respiration, not passive flow of water, determines the volume of water aspirated.” He adds his own clarification immediately following this statement, “Water will not enter the lungs of a cadaver; the water is inhaled by drowning persons, which fills the lungs with water.” Because I had just one page of this study, I gave Modell a call.

Modell is a professor in the Department of Anesthesiology at the University of Florida College of Medicine in Gainsville, Florida and the University’s associate vice president of Health Affairs. A significant portion of his lengthy curriculum vitae is taken up with work in drowning and near-drowning. He is involved in both research and treatment. He has also acted, on approximately 150 occasions, as an expert witness in drowning litigation. His research is internationally known and referenced.

Modell says both his dog and human autopsy studies show that water *does not* fill the lungs. “This is an erroneous statement. More than likely, some amount of water enters the lung in the vast majority of cases, probably in over 90%. However, the amount of water that actually enters the lungs varies considerably and, in the vast majority of cases it is 22ml/kg or less—and in most of those cases substantially less.” (This translates to roughly a tablespoon of water per pound weight of the victim).

For approximately the first two minutes of a submersion the person is most often in laryngospasm, Modell says, which keeps water from the lungs. Longer than two minutes the laryngospasm abates and the person begins to inhale water. However, it has been “decisively shown,” says Modell, that fresh water

is very rapidly absorbed from the alveoli into circulation. This produces, "…an inability to recover significant amounts of water, either by drainage or suction, within three minutes of the onset of submersion. What is left in the lungs is pulmonary edema fluid (which is very frothy and not easily expelled) not aspirated water. Dr. Heimlich chooses to ignore these studies." Salt water, which is three times the salinity of the blood, does not move out of the lungs nearly as fast but rather draws plasma from the blood to the lungs, creating even more pulmonary edema.

Modell says Heimlich incorrectly states the maneuver expels water from the lungs, noting that at the scene of a rescue, there is no way to know where the fluid is coming from. And as far as Heimlich's contention that not one scientific study exists that demonstrates the effectiveness of CPR, Modell mentions the "countless numbers" of people who experience cardiac and respiratory arrest as a result of submersion, and who survive when CPR is administered.

"For the most part, these persons are treated with CPR, which reestablishes circulation and ventilation," he states. "I do not know of a single case in which, once respiration and circulation have ceased, that by ignoring the patient and *not* applying CPR, the patient spontaneously recovered."

"To prove that the Heimlich maneuver is superior to conventional CPR for submersions victims, a well-controlled comparative study of the two approaches would have to be done. No such study has been performed," Quan.

The problem when it comes to drowning and resuscitation research is that the subject matter of choice—humans—do not drown in scientifically controlled environments. This is why most research into these areas has been done on animals. But data derived from animal studies does not rank as high as data generated from human studies. Consequently, there is continued interest in studying this issue by compiling data on human submersions.

However, this is terribly difficult. Research is a real "yeah, but" situation. By this I mean that researchers usually work to identify all the variables (factors) that could confound (influence) their results—hence the, "yeah, but what about this?" syndrome. This is essential because if the results are going to be valid, the groups being studied have to be comparable, or the outcome will be skewed.

Imagine all the variables that could confound drowning and near-drowning data and subsequently, the results. Submersion time is extremely important and has a huge impact on outcome, so this would have to be controlled. Yet both Modell and Quan note the difficulty of getting accurate information on how long a victim has been submerged. "People always under or over estimate," says Modell. "It's been my experience that if you have three witnesses to a drowning, you will have three different submersions times." So if either the CPR or the maneuver group had victims with longer submersion times than the other, the results would be skewed.

A host of other factors, such as water temperature, environment (fresh, salt, or contaminated water), age and health of the victims, condition upon rescue (breathing, not breathing, pulse, no pulse) who provided initial care (trained personnel or bystander) also exert an influence—and this is just a partial list.

Ellis & Associates, Inc., an aquatic training and safety consulting company based in Houston, Texas, faces the same difficulties in trying to gather meaningful data. The company switched their protocol in 1995 to one that uses the maneuver as a first response. Since then, they have been collecting submersion data on the maneuver. They also have data starting from 1985 when Ellis-trained guards were still responding with CPR first. But, says Larry Newell, educational consultant for Ellis, the older data is not comparable to the maneuver data, which makes a meaningful comparison between the two protocols impossible.

Jeff Ellis, president of the company says they have found that both CPR and the maneuver produced "similar and successful outcomes." However, he adds, the average hospital stay for those resuscitated with CPR compared to those who were given the maneuver was four days vs only a few hours in the ER respectively. The problem here is that there may be confounding variables skewing their results. For example, were any changes made around 1995 in paramedic or hospital protocols, or in the equipment they used, that could have resulted in shorter stays? Could the fact that Ellis & Associates implemented their 10/20 Rule around 1989, resulting in faster retrieval times, have exerted an influence? These questions, and others, surrounding the Ellis data underscores the challenge of trying to study this issue outside a controlled environment and why most in the medical and rescue communities are unwilling to draw any conclusions about the reported "success" of the maneuver based on these statistics.

"The committee has a number of concerns about the changes Heimlich and colleagues have suggested…" 1994 Institute of Medicine Report.

The Institute of Medicine (IOM), National Academy of Science (NAS) has twice commissioned a special committee of scientists to review evidence in support of this issue. The first report was released in 1991 and concluded the maneuver should not precede the standard airway, breathing, and circulation (ABC) assessment. Heimlich challenged that report and another committee within the NAS concluded the issue needed to be revisited.

Consequently, a new IOM committee was assembled in 1994 to review and evaluate the existing scientific literature and evidence on the treatment of near drowning victims to see if the ECC guidelines need to be revised. Heimlich was also invited to present. The committee concluded among other things that:

- There is no evidence that death from drowning is frequently caused by the aspiration of a solid foreign body that is not effectively treated by current ECC recommendations.

- That although the maneuver is useful for the removal of solid foreign bodies, the evidence is insufficient the maneuver is useful for the removal of aspirated liquid.

- There is no evidence that near-drowning victims aspirate substantial amounts of water or that such aspirated liquid causes brain damage and death.

- The evidence does not support the routine use of the maneuver in the care of near-drowning victims.

The committee also characterized Heimlich's analogy of a straw to explain the maneuver as simplistic and inappropriate. They expressed several concerns, one of them being over the amount of time ventilation would be delayed by doing the maneuver until the victim was no longer expelling fluid, especially since it is felt this fluid comes from the stomach. (One study the committee reviewed done by Reuben and Reuben concluded, "When more than a small amount of water flows from the mouth of a drowning patient, subjected to artificial respiration, it comes from the stomach.").

The committee was also concerned about the lack of valid data demonstrating the maneuver's "efficacy" in near-drowning cases (an apparent reference to and objection over the anecdotal nature of much of Heimlich's evidence). At the same time they acknowledged how difficult collecting this data would be. However, the report concludes, considering the lack of evidence supporting the use of the maneuver in near-drowning situations, "It is hard to imagine a research methodology for such a study that would or should be approved by a human studies committee."

Heimlich has declared both the 1991 and 1994 reports to be "fraudulent" and has compiled a lengthy list of what he says are omissions and misinterpretations. However, at this point, the IOM has no plans to revisit the topic.

"If I thought the maneuver would be helpful I would use it. My concern is that it will delay the proper therapy," Dave van Stralen, M.D.

In an effort to get feedback from someone who had not been directly involved in this disagreement, I contacted Loma Linda University Children's Hospital in California, renowned for its work with infant heart transplants. I was put in touch with van Stralen, assistant director of pediatric ICU and medical director for the San Bernardino County Fire Department. Between his hospital and past fire department paramedic work he has cared for approximately 390 submersion victims.

I wanted to discuss an event described by Patrick. In 1980 he was the attending ER physician at Lima Memorial Hospital in Lima, Ohio, when paramedics brought in a two-year old drowning victim who had been submerged about 20 minutes. During the 20-minute ride to the hospital the child was given CPR. Upon her arrival Patrick placed an endotracheal tube in the girl and after suctioning an unmeasured amount of water from this tube, began bagging with 100% oxygen. When this produced no airflow sounds over the lungs he performed the maneuver several times and expelled approximately 30cc of fluid (an unknown amount of water was also suctioned from the tube after Patrick did the maneuver). This resulted in the return of airflow sounds over both lungs, although the child later died. Patrick says this proves the maneuver removes water from the lungs and that water blocks ventilation.

He also noted the girl's stomach and intestines were "extensively dilated with gas" (determined via a portable chest x-ray). Patrick stated this was the result of mouth-to-mouth breathing delivering air to the stomach and intestines rather than to the lungs, citing this as further proof of water's ability to impede ventilation.

"Well I wouldn't be comfortable saying this is 'proof' that mouth-to-mouth was delivering air to the stomach rather than to the lungs," van Stralen tells me. "The distension could have been caused by several factors. We do know that children in a drowning situation swallow a lot of water and air because they are scared, and this could have been the case here. It could also be the result of masked ventilation rather than mouth-to-mouth. My experience has been that stomach distention is more common with masked ventilation, because the positioning of the mask is less effective, rather than with mouth-to-mouth.

He also questions the significance of the amount of fluid expelled since 30cc only equals about two tablespoons. "I would want to know what the oxygen levels were before he did the maneuver and after (Patrick reports only on blood gases taken about 22 minutes after he did the maneuver). If doing the maneuver improved oxygenation significantly, then I would be interested," he states. "But to be honest, I have never had a problem when oxygenation was hanging in at under 90% in getting it up with standard procedures. And if oxygenation is at 90% or above, why add another therapy by doing the Heimlich? At this point," he concludes, "I just don't see the need for it." And, van Stralen adds, a child submerged for 20 minutes in anything less than ice water is going to have a poor outcome regardless of what was done.

I also contacted Alan M. Steinman, M.D., a retired rear admiral of the US Public Health Service and the US Coast Guard, and the Guard's former director of health and safety, a position, he describes as equivalent to that of Surgeon General. During his career, Steinman participated in "dozens" of water rescues and resuscitations. He was instrumental in establishing the Coast Guard's EMT and Rescue Swimmer programs and is widely published in the field of water survival and water rescue.

“In all my training, education, and especially experience, using the Heimlich maneuver as the initial procedure in resuscitating near-drowning victims is inappropriate, unhelpful, and potentially dangerous for the patient,” Steinman says, speaking from his home in DuPont, Washington.

Steinman confirms that most drowning victims do not have water totally obstructing their upper airways although they do swallow “huge amounts” of water, resulting in gastric distension. He notes that while many drowning victims vomit during CPR not everyone does, or they do so after CPR has begun. “But deliberately pressing on the abdomen, as you would with the maneuver” he says, “is a sure way of inducing vomiting. And aspirating of stomach contents significantly increases the fatality rate in drowning victims.”

Furthermore, he continues, since fluid in the alveoli is primarily pulmonary edema resulting from water damage to the lungs, and because this fluid is quite thick and not easily expelled, it is “highly unlikely” the maneuver would remove any of this. The primary concern, Steinman says, should be immediate ventilation.

“An international conference on drowning, hypothermia, and cold-water survival was recently held in Winnipeg, and the latest information on resuscitation was discussed. The maneuver was not recommended by these world-wide experts,” Steinman says. “Finally,” he adds, “the US Coast Guard, an organization that knows a thing or two about water rescue and resuscitation, does not use or recommend the Heimlich maneuver for the resuscitation of near-drowning victims.”

The International Life Saving Federation (ILS) a confederation to which most national lifesaving groups belong, does not endorse the maneuver as an initial response either, says Chris Brewster, lifeguard chief for the City of San Diego, California. Brewster is vice president of ILS and performs a variety of volunteer functions for the United States Lifesaving Association. He has been trained as an EMT since 1980.

Brewster first heard Heimlich speak on this subject in 1995 at a board of directors meeting of the United States Lifesaving Association. Heimlich explained his views and then advised those attending to use his methods. This concerned Brewster.

“My EMT instructors over the years have made it clear that there are general immunities of law for EMTs who practice in good faith according to the instructions and protocols they have been provided in their training,” he explains. “They make it equally clear that varying from those protocols creates a tremendous personal and institutional liability potential.”

Nevertheless, says Brewster, Heimlich directly solicits the front-line providers of care, recommending they ignore their training protocols and listen to him instead. “While criticism of existing protocols is fair comment,” Brewster states, “what Heimlich is advising lifeguards and others to do is unethical and reckless. In effect, Dr. Heimlich is encouraging that human experimentation on his theories be practiced by lifeguards on unknowing victims.”

Frank Pia agrees. Pia earned his stripes during the 70s as a lifeguard at Orchard Beach in the Bronx (New York) one of the most active rescue beaches in the country. Approximately 2,000 people a season are pulled from its waters. Pia spent 21 years there, rising to the rank of chief. He has administered CPR to drowned persons on at least 50 occasions. He also originated the ‘Distress vs Drowning Classification, and conducted original research on the ‘Instinctive Drowning Response.’ He currently consults and lectures extensively on drowning and near-drowning.

"It is my position that lifeguards must follow the standard of care for CPR and first aid that was utilized during their training and sanctioned by their state health departments," says Pia, who opposes using the maneuver as a first response. "Lifeguards, EMTs, and paramedics are generally neither physicians nor credentialed medical researchers. They should not and must not develop standards of care that have not been approved by medical authorities."

Of particular concern to both Pia and Brewster is the mandate the maneuver be administered until no more fluid comes out. This delay of ventilation might not be so serious in a waterpark environment, where submersion times are brief and the amount of water swallowed probably minimal. But it could have dire consequences in an open-water area, where submersion times are likely to be longer. Here, victims can swallow a great deal more water, and doing the maneuver until no more fluid is expelled can take minutes, not seconds.

In September 1997, Brewster co-organized the ILS International Medical/Rescue Conference and invited Heimlich to attend. He did not respond to the invitation, but other doctors involved in drowning and resuscitation did. In total, six medical experts from around the world gave presentations and went through an "extensive" question and answer session. All were asked for their views on the maneuver for drowning and whether lifeguards should use it as a first response. All of them said no.

After further review, the ILS medical commission, composed of an international group of physicians (from areas such as Australia, South Africa, Brazil, Canada, Sweden, the Netherlands, the United Kingdom, and the U.S) who serve as medical advisors to national lifesaving organizations in various countries, issued a report in 1998. This report stated that in the case of near drowning, the use of the maneuver is "contraindicated" unless there is a solid body present in the upper airway that "cannot be dislodged by other means."

But Heimlich has supporters. In addition to Ellis & Associates, the non-profit Save A Life Foundation, Inc., based in Schiller Park, Illinois, also advises would-be rescuers to do the maneuver first.

Established in 1993, the foundation focuses on public education and on encouraging bystander involvement in emergency situations. Both Heimlich and Safar sit on its Medical Advisory Board. According to medical director, Stanley Zydlo, M.D., people were initially told to use CPR first. "However," says Zydlo, who is a former flight surgeon with the Strategic Air Command, and is currently working at Rose Copley Medical Center (Aurora, Illinois) as an emergency physician and EMS director, "after researching the documented literature, we felt something different had to be done."

Contributing to this decision was the 42% fatality figure taken from Quan's study, as well as "the recognition that oxygen does not get through water-filled lungs into the blood vessels." It seems "only logical" Zydlo concludes, to remove this water before attempting ventilation. He looks to Ellis' 3% mortality rate and compares that to CPR's "median mortality of 40%"— a figure supplied by Heimlich— as further evidence of the maneuvers' effectiveness.

However, say Steinman and others, Ellis's low mortality rate is more likely the result of their victim's short submersion times, which the company reports as averaging approximately 29 seconds. With submersion times this brief, says Modell, people clearly would not have experienced cardiac arrest. He adds that almost no one submerged 29 seconds or less inhales any water.

Jeff Ellis says the medical community is beginning to notice their results and has expressed interest in doing more research on the matter. He also says that data generated by international agencies using this procedure has shown results similar to their own, and that "increasing number of doctors" are contacting them about their data.

But future resuscitation research is not the immediate concern for waterparks. The fact that they may be using a resuscitation technique that at this point has little medical or scientific support is a more primary issue. In light of the findings, it seems advisable for park owners to review and discuss their protocols not just with their aquatic service providers but with their legal counsels and insurance agents as well.

With safety, as with so many things in the business, there is a tendency to want to be on the cutting edge. No park operator wants a guest to ever come to harm because of something that wasn't done. But on this issue, park owners must make a critical assessment of their resuscitation methods. Managers must satisfy themselves that before their lifeguards blow the whistle signaling the start of another season, these people have been given the best tools and techniques to safeguard lives.

EDITOR'S NOTE: This report was submitted to Ellis & Associates for review and comment in late February. On March 10, Ellis & Associates sent to their clients and posted on their web site a revised protocol for the care of submersion victims. Citing further data analysis of rescues since 1995 when Ellis & Associates implemented the Heimlich maneuver as an initial response, the company revised its protocol to align its training procedures with the standard approach recommended by the medical community, the American Heart Association, and the American Red Cross.

Ellis and Associates plans to expand its efforts to collect comprehensive data on submersion victims to help better understand what care truly makes a difference in victim outcome following submersion incidents.