Public Health

Drowning in Canada

Epidemiology

There were 566 deaths from drowning in Canada in 1997. Most of these were related to boating activities (176, 40%), swimming (103, 23%) and unintended falls into water (104, 23%). Populations that appear to be at particularly high risk of drowning include toddlers aged 1–4 years (1.85 drownings/100 000), youth aged 15–19 years (1.28/100 000), people with seizure disorders (8–20/100 000), recreational fishermen aged 65–74 (0.72/100 000) and aboriginal men aged 25–34 (25.6/100 000).[1]

"Drowning" is death by suffocation after submersion in a liquid medium. "Near drowning" occurs when a patient recovers, at least temporarily, from a drowning episode. Patients who initially recover but then die within 24 hours are classified as drowning victims.[2] "Secondary drowning" refers to death from complications of submersion at least 24 hours after the episode.[3] "Immersion injury" is a generic term that refers to all patients who have experienced submersion,[2] while "immersion syndrome" refers to sudden death after contact with cold water.[3] Immersion injuries have a high case-fatality rate.[4]

Clinical management

Cerebral hypoxia is the common final pathway in drowning victims. Whereas approximately 15% of victims have acute laryngospasm, resulting in "dry drowning" from profound obstructive asphyxia, most drowning victims aspirate.[2]

Aspiration of even small amounts of fluid (1–3 mL/kg body weight) can lead to severe abnormalities in gas exchange. In the 1970s it was believed that hypertonic sea water would draw plasma volume into the interstitial space while fresh water would have the opposite effect, leading to hypervolemia and dilutional hyponatremia. It later became clear that volumes far greater than what is normally aspirated in drowning are required to create these proposed blood volume changes.

Both fresh and sea water wash out surfactant and create the potential for noncardiogenic pulmonary edema.[2] Near drowning in icy water results in a higher chance of survival, perhaps because of the diving reflex that preferentially shunts blood to the brain.[3] Contaminants in the water, such as chlorine and bacteria, contribute to the common complications of acute respiratory distress syndrome and pneumonia.[2]

Cardiopulmonary resuscitation (CPR) should be instituted as soon as possible. In the hypothermic patient, sinus bradycardia or atrial fibrillation may be present, making the pulse difficult to palpate, so rescuers should take a full minute to assess vital signs. The patient should be extricated rapidly from the water, with spinal cord precautions being observed. The Heimlich manoeuvre is of unproven benefit.[2]

As soon as possible, supplemental oxygen and bag and mask ventilation with proper positioning of the jaw and tongue should be administered; prehospital tracheal intubation and the administration of drugs (i.e., epinephrine) should be carried out when indicated.

Resuscitative efforts in the emergency department may involve the application of positive end expiratory pressure and the correction of acidosis, hypovolemia and hypothermia.[3] Since drowning victims often experience multiple organ failure, admission to the intensive care unit is usually indicated.

Patients who are conscious on arrival at the hospital after successful resuscitation have an excellent chance of recovery, but a child who requires CPR in the emergency department will almost certainly die or experience significant neurologic sequelae.[4] Children who present to the emergency department with a Glasgow coma scale ≥13, undergo a normal physical exam and have normal respiratory effort and an oxygen saturation of at least 95% on room air 4–6 hours after arrival in the emergency department can be safely discharged home.[5]

Prevention

Generally, children are not developmentally ready for swimming lessons until after their fourth birthday.[6] Aquatic programs for infants and toddlers have not been shown to decrease the risk of drowning, and parents should not feel that their child is safe after participating in such programs.[6] Parental supervision and appropriate application of barriers around pools, including four-sided fencing with self-closing and self-latching gates and doors, and pool safety covers, may prevent some accidents involving toddlers.[2]

In 71% of boating fatalities, the victim was not properly wearing a flotation device; in 46% of these fatalities, alcohol was known to be involved.[1] The alarmingly high rate of drowning among aboriginal groups signals the need for culturally appropriate and community-endorsed interventions to reduce harm. — *Erica Weir*, CMAJ

References

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