Hyperventilation-Induced Blackout

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Shallow Water Blackout (SWB) vs. Hyperventilation-Induced Blackout (HIB)....

There has been a great deal of confusion and mixed messages pertaining to Shallow Water Blackout, prolonged breath holding, and blackout induced by hyperventilation and prolonged breath holding. For the purpose of clarification, we will be using the term Hyperventilation-Induced Blackout (HIB) to describe the incidence of blackout induced by hyperventilation and prolonged breath holding.

The confusion is that the term "shallow water blackout" (SWB) has been used to describe any case of unexplained loss of consciousness. In reality, SWB is actually a problem experienced by breath-hold divers traveling vertically through a substantial depth range. Descending through the water column compresses the gas in the lungs, driving more gas into the blood, which increases the amount of oxygen available to be consumed. As the breath-hold diver ascends through the water column the blood oxygen level falls much faster than it would without the vertical excursion. And, since the relative pressure change is greatest in the shallowest water, it is normal for blackout to occur in the final state or just after surfacing.

Extended Breath-Holding....

The Aquatics Community needs to accept the fact that breath-holding is part of all aquatic activities. But, we need to urge caution on the part of swimmers (competitive and recreational), coaches, first responders, lifeguards, residential pool owners, parents, and aquatic facility managers and operators, that extended breath-holding, preceded by excessive hyperventilation (ventilating the lungs in excess of metabolic need) is safe if it is limited to the equivalent of no more than two full ventilatory exchanges (two full inhalation/exhalation cycles). Limited hyperventilation will increase breath-hold time without delaying the urge to breathe (driven by carbon dioxide levels in the blood).

Supervision....

We need to encourage supervisors (coaches, lifeguards, facility operators) to carefully scan the surface, as well as under the surface, as many HIB victims may float motionless at the surface, or may submerge, dependent upon several variables. And, that the victim floating at the surface may appear to be moving due to water movement, splashing, etc.

Risk Management....

Prolonged breath-holding does not necessarily need to be banned. But, we need to stress the importance of safeguarding participants while they are engaged in this type of activity. But, if the facility is unable to safeguard the swimmer while he/she is engaged in this activity, then that activity should be prohibited. This is a basic tenant of Risk Management in that we REMOVE or WARN of the HAZARD, and we either SAFEGUARD or PROHIBIT the RISK.

Emergency Resuscitation Protocols....

The proper response to a hyperventilation-induced blackout incident is to rescue the victim from the water and to immediately obtain a patent airway using either a head-tilt or a jaw-thrust maneuver.

Assess the victim's breathing, and if the victim is in respiratory arrest, then immediate positive pressure ventilation should be provided.

Check the pulse, and if the victim is in cardiac arrest, then immediate CPR should be administered, and an AED should be obtained and attached. If the victim has a shockable rhythm, as assessed by the AED, then a shock should be administered, and CPR continued if the victim remains in cardiac and respiratory arrest.

It should be noted that if the HIB victim is removed from the water and is assessed to be in cardiac arrest, it is typically due to the fact that the victim's distress went unrecognized for up to several minutes - long enough for the onset of cardiac arrest.

Oxygen Administration....

Drowning is a hypoxic event, regardless of the cause. Positive pressure ventilation should be administered via mouth-to-mouth, mouth-to-nose, or mouth-to-mask. Lifeguards and other First Responders should be trained in the use of a Bag-Valve-Mask (BVM) Resuscitator which, if used correctly, will provide 21% oxygen concentration to the patient with each ventilation, versus 16% as administered via mouth-to-mouth, mouth-to-nose, or mouth-to-mask.

Lifeguards and other First Responders should also be trained and equipped with oxygen administration equipment (oxygen tank and regulator). The oxygen administration equipment should be attached to the BVM resuscitator, with the oxygen flowing at 15 lpm, which therefore provides 100% oxygen concentration during the administration of positive pressure ventilation.

Compression-Only CPR....

It should be noted that CPR includes the administration of chest compressions in combination with rescue breathing (positive pressure ventilation). The American Heart Association is advocating compression-only CPR for victims of sudden cardiac arrest (SCI) and CPR courses are being conducted throughout the U.S. teaching the lay public how to perform compression-only CPR. However, this procedure is only designed for the SCI patient whose lungs, blood and brain are already oxygenated prior to the onset of the cardiac arrest.

To the contrary, a drowning victim, regardless of the cause, unless the victim suffered an SCI in the water, his/her cardiac arrest onset would have occurred as a result of the victim's respiratory arrest, and the victim is therefore hypoxic. Compression-only CPR is ineffective for the drowning victim and full CPR (positive pressure ventilation in combination with chest compressions), AED use, and oxygen administration is required to provide the victim with the best chance for a successful outcome.

We are encouraging the following reminder:

If DRY - COMPRESSIONS apply.
If WET - give BREATHS and PRESS

Credit & Additional Information....

Thanks are extended to the NDPA and to Neal W. Pollock, Ph.D., Research Director for Divers Alert Network (www.diversalertnetwork.org) and to the National Drowning Prevention Alliance (www.ndpa.org).

For more information, go to "Loss of Consciousness in Breath-Holding Swimmers", published on the National Drowning Prevention Alliance website at http://ndpa.org/loss-of-consciousness-in-breath-holding-swimmers/