Drowning / Submersion Injuries

History
- Submersion in water regardless of depth
- Possible history of trauma ie: diving board
- Duration of immersion
- Temperature of water or possibility of hypothermia
- Degree of water contamination

Signs and Symptoms
- Unresponsive
- Mental status changes
- Decreased or absent vital signs
- Vomiting
- Coughing, Wheezing, Rales, Rhonchi, Stridor
- Apnea

Differential
- Trauma
- Pre-existing medical problem
- Pressure injury (diving)
- Barotrauma
- Decompression sickness
- Post-immersion syndrome

See Pearls for Scuba Diver considerations

Spinal Immobilization Guideline [149]

Mental Status Exam

Awake and Alert
- Remove wet clothing
  Dry / Warm Patient
- Monitor and Reassess
  Encourage transport and evaluation even if asymptomatic
  Asymptomatic near-drowning victims should be observed 4 to 6 hours for development of symptoms
- Vascular Access Procedure
- Cardiac Monitor if indicated

Awake but with AMS
- Consider aggressive airway management
  Age Appropriate Airway Guideline(s) as indicated
  Age Appropriate Altered Mental Status Guideline as indicated [81] [131]
  Remove wet clothing
  Dry / Warm Patient
- Vascular Access Procedure
  Cardiac Monitor
  Consider EtCO2 monitoring
  Use PEEP valve if manually ventilating with BVM

Unresponsive
- Pulse
  More than 60 minutes submersion time?
  NO
  Visible ice on water, water temp < 70F, or pediatric patient
  NO
  Any respiratory effort, non-asystolic rhythm, or reactive pupils?
  NO
  Hypothermic? (Core temp presumed to be < 93F)
  NO
  Initiate transport to regional Trauma Center
  NO
  Exit to Age Appropriate Cardiac / Pulseless Arrest and / or Arrhythmia Guideline(s) [61] [117]
  YES
  Consider Hypothermia Guideline if indicated [169]
  YES
  Consider Medical Control consultation if > 30 minutes submersion time
  YES
  Do not initiate resuscitation efforts

Notify MRCC
Drowning / Submersion Injuries

Diver’s Alert Network
(919)-684-9111
24-hour emergency medical consultation

- Decompression injuries (i.e. “The Bends”, nitrogen narcosis, air emboli) can occur after an ascent from any depth when using SCUBA equipment. Typical symptoms include severe joint pain, chest pain, breathing difficulty, or altered mental status. **These patients should be transported to the nearest hyperbaric facility unless other confounding injuries are present (burns, major trauma).** Avoid air transport (unless low altitudes can be maintained) as this will exacerbate the decompression injury further. Consider Diver’s Alert Network and medical control consultation to assist with the management of these patients.

- After 60 minutes of submersion the likelihood of successful resuscitation approaches zero, and the risk to rescuers increases. Unless special circumstances are present (i.e. visible ice on water, pediatric victim) consider transitioning efforts from rescue to recovery after 60 minutes. Utilize MRCC for medical control consultation as appropriate.

- Positive pressure ventilation should be considered for any drowning victim with respiratory difficulty or unresponsiveness. CPAP would be appropriate for the awake patient, and a PEEP valve should be used in conjunction with a BVM for any patient requiring ventilatory assistance following a submersion/drowning injury.

**Pearls**
- **Recommended Exam:** Trauma Survey, Head, Neck, Chest, Abdomen, Pelvis, Back, Extremities, Skin, Neuro
- Ensure scene safety. Drowning is a leading cause of death among would-be rescuers.
- Allow appropriately trained and certified rescuers to remove victims from areas of danger.
- With cold water submersion there is an increased chance of survival even with cardiac arrest and prolonged submersion. **Have a low threshold to initiate resuscitation, consider medical control consultation early.**
- Have a high index of suspicion for possible spinal injuries
- Hypothermia is often associated with drowning and submersion injuries.
- All victims should be transported, even if asymptomatic, for evaluation due to potential for worsening over the next several hours.
- With pressure injuries (decompression / barotrauma), consider transport to or availability of a hyperbaric chamber.
- Post-drowning patients who are awake and cooperative but with respiratory distress may benefit from CPAP.

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