FOUNDATIONS of Emergency Medicine

Foundations Frameworks

Approach to Hypothermic Resuscitation

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1. Suspicion of Hypothermia: Rapid Assessment

a. Obtain rectal core body temperature immediately
   i. Temperature ≤ 32°C → enter pathway

2. Cold + Alive: Vital Signs Present

a. Stable(ish) Hypothermia

i. "Conservative Treatment" → stable patient, unlikely to need ECMO

ii. Features include:
   1. Temp > 28°C
   2. Stable cardiac features (low likelihood to degenerate into malignant arrhythmia or cardiac arrest)
      a. NSR, bradycardia, atrial fibrillation
      b. Normotensive

iii. Treatment: these patients need rewarming:
   1. Passive External Rewarming: move to warm environment, remove cold/wet clothing, apply warm blankets
   2. Active External Rewarming: forced-air warming systems (e.g. Bair Hugger), heat packs, warm water bath
   3. Active Internal Rewarming: warm IV fluids, bladder lavage, airway rewarming via heated ETT inspired air, gastric lavage, thoracic/peritoneal lavage

b. Unstable Hypothermia

i. "Aggressive Treatment" → unstable patient, consider transfer to ECMO center after initial resuscitation

ii. These patients are highly unstable and may degenerate into cardiac arrest → recommended that these patients receive care at an ECMO facility (consider transfer if not at an ECMO facility)

iii. Features include:
   1. Temp ≤ 28°C
   2. Unstable cardiac features (high likelihood to degenerate into cardiac arrest)
      a. Ventricular ectopy/arrhythmias
      b. Severe hypotension

iv. Treatment:
   1. Airway management, warm fluid resuscitation, vasopressors
   2. Active external/internal rewarming
   3. Limit movement: to avoid inducing an arrhythmia
   4. Strongly consider transfer to ECMO center

3. Cold + Dead: No Vitals Present

a. **Salvageable**
    i. These patients have a chance at neurologic recovery
    ii. Situation in which hypothermia causes the arrest
    iii. These patients need ECMO, consider transfer to ECMO center if within 6 hours of arrest with "good story" for hypothermic arrest
    iv. Even if you get ROSC, they will likely still need ECMO services (ARDS)
    v. Treatment:
        1. Start high quality chest compressions
        2. Initiate ECMO if available
        3. Active external/internal rewarming
        4. Shocks/Epi?
            a. Mixed data
            b. European Resuscitation Council Guidelines: up to 3 defibrillations until > 30°C, withhold epi until core temp > 30°C (already highly vasoconstricted), 30-35°C: give epi every 6 minutes (instead of every 3 minutes)
            c. American Heart Association Guidelines: states that it is reasonable to consider administration of a vasopressor and shocks in usual ACLS algorithm
    vi. If ECMO not available, arrange transport to ECMO center. Continue CPR and rewarming. In hypothermic arrest patients who receive ECMO or bypass, survival can reach up to 50%
    vii. Patient Not Dead Until Warm and Dead
        1. Withdraw care if patient temp > 32°C and still no pulse

b. **Unsalvageable**
    i. These patients are cold but unsalvageable and will not benefit from continued resuscitation
        1. Chest wall frozen solid + not compressible
        2. Potassium Level > 12 mmol/L
            a. Severely elevated potassium is associated with non-survival and is a marker of hypoxia before patient became hypothermic
        3. Hypothermia not cause of arrest: patient died before cooling took place, likely not a true hypothermic arrest
            a. Cardiac arrest, traumatic arrest, etc.
            b. Example: Immersion vs. Submersion
                i. Immersion: Patient immersed in cold water but able to breath, suffers hypothermia arrest before onset of hypoxia and cardiac arrest → survival with neurologic impairment possible
                ii. Submersion: Patient with submersion in cold water and suffers hypoxia induced arrest prior to cooling → unlikely to have significant neurologic recovery

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