

UBC Department of Emergency Medicine  
Royal Columbian Hospital Grand Rounds October 23, 2019

**Learning Objectives:**

1. accurately stage, triage and manage accidental hypothermia patients based on the vital signs and level of consciousness
2. identify which cold patients in cardiac arrest are unlikely to benefit from resuscitation and which patients may benefit from prolonged resuscitation and rewarming
3. select the appropriate warming technique and treatment facility for hypothermic patients
4. understand the BC Hypothermia Clinical Practice Guideline and explore the potential for guidelines to improve patient outcomes
5. learn about two recently published tools for prognostication of hypothermic cardiac arrest (Hope score & Ice score) and how to apply them clinically

Resources:

BC Hypothermia CPG

[https://www2.gov.bc.ca/assets/gov/health/practitioner-pro/bc-guidelines/bc\\_hypothermia\\_cpg.pdf](https://www2.gov.bc.ca/assets/gov/health/practitioner-pro/bc-guidelines/bc_hypothermia_cpg.pdf)

NEJM Review Paper

<http://drdougbrown.ca/wp-content/uploads/2012/12/Accidental-Hypothermia-NEJM-Review-Article-2012.pdf>

Ice Score

<http://drdougbrown.ca/wp-content/uploads/2012/12/ICE-IPD-Prediction-and-Risk-Stratification-of-Survival-in-Accidental-Hypothermia-Requiring-ECLS-Brown-Saczkowski.pdf>

**Take Home Points / Suggestions to Achieve Learning Objectives on Following Pages** (taken from BC Hypothermia CPG):

1. accurately stage, triage and manage accidental hypothermia patients based on the vital signs and level of consciousness

Table 1: Staging and Treatment of Accidental Hypothermia<sup>1,3,4,5,8,9</sup>

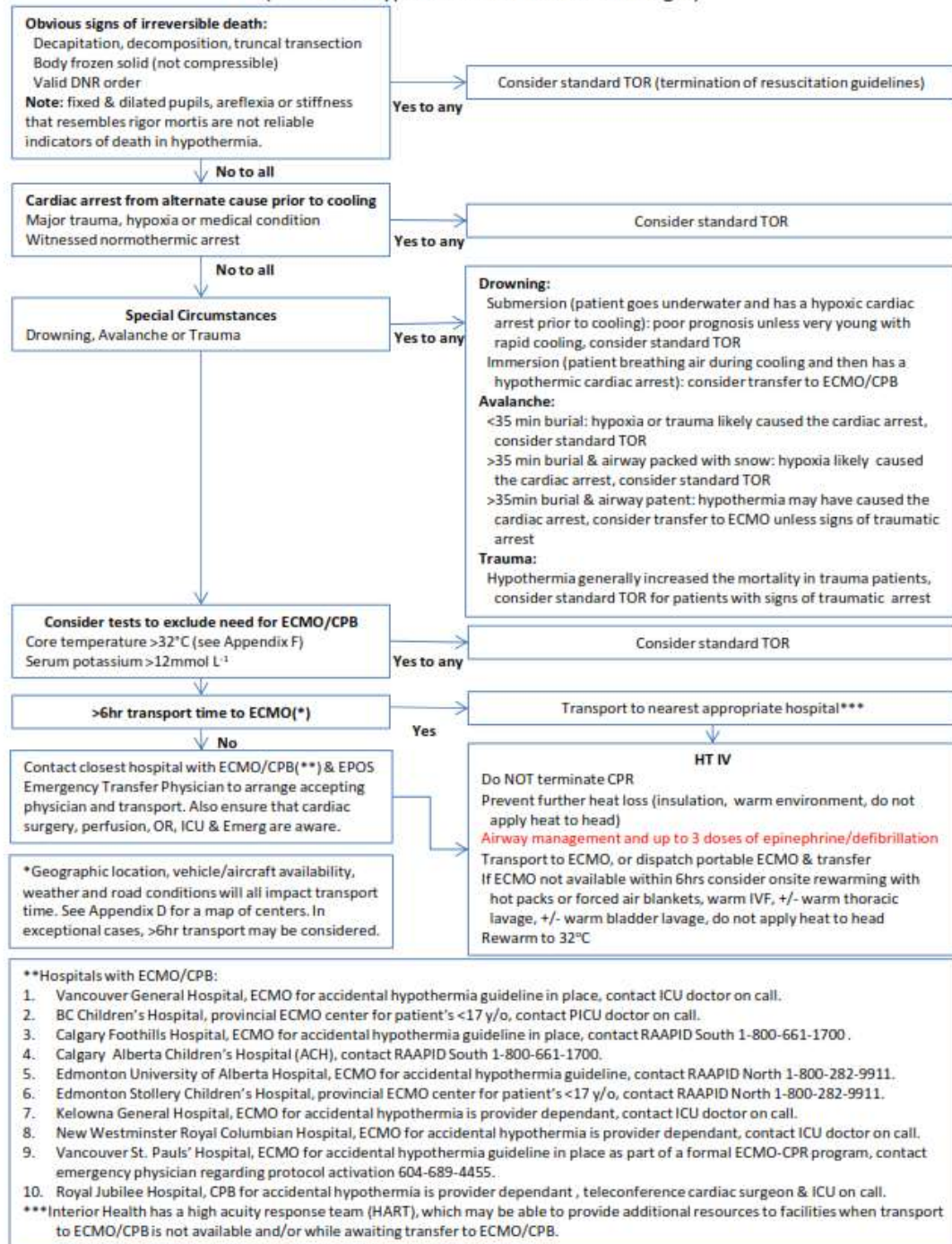
Stage	Clinical Symptoms	Typical Core Temperature	Treatment
HT I (Mild)	Conscious, shivering	35 to 32 °C	Warm environment and clothing, warm sweet drinks, and active movement (if possible)  HT I patients with significant trauma, co-morbidities or those suspected of secondary hypothermia should receive HT II treatment
HT II* (Moderate)	Impaired consciousness** (may or may not be shivering)	<32 to 28 °C	Active external and minimally invasive rewarming techniques (warm environment; chemical, electrical, or forced-air heating packs or blankets; warm parenteral fluids)  Cardiac & core temperature monitoring  Minimal and cautious movements to avoid arrhythmias  Full-body insulation, horizontal position and immobilization
HT III (Severe)	Unconscious**, vital signs present	<28 °C	HT II management plus:  Airway management as required  Preference to treat in an ECMO/CPB center, if available, due to the high risk of cardiac arrest  Consider ECMO/CPB in cases with cardiac instability that is refractory to medical management  Consider ECMO/CPB for comorbid patients that are unlikely to tolerate the low cardiac output associated with HT III
HT IV	Vital signs absent	cardiac arrest is possible below 32°, the risk increases substantially below 28°C and continues to increase with ongoing cooling	CPR and up to three doses of epinephrine and defibrillation (further dosing guided by clinical response)  Airway management  Transport to ECMO/CPB***  Prevent further heat loss (insulation, warm environment, do not apply heat to head)  Active external and minimally invasive rewarming (see HT II) during transport is recommended but controversial, do not apply heat to head  ***Transferring a HT IV patient to an ECMO/CPB center may reduce mortality by 40-90% (NNT ~2), if ECMO/CPB is not available within six hours of transport, <sup>1,2,7,10,11</sup> consider onsite rewarming with hot packs or forced air blankets, warm IVF, +/- warm thoracic lavage, +/- warm bladder lavage +/- warm peritoneal lavage, do not apply heat to head

\*If transport times are similar to an ECMO/CPB centre or an alternative centre, consider preferential transport to the ECMO/CPB centre for patients with a core temperature <32°C.

2. identify which cold patients in cardiac arrest are unlikely to benefit from resuscitation and which patients may benefit from prolonged resuscitation and rewarming

## Appendix B: EPOS Triage Tool for Stage IV Accidental Hypothermia

(Accidental Hypothermia with Absent Vital Signs)





### 3. select the appropriate warming technique and treatment facility for hypothermic patients

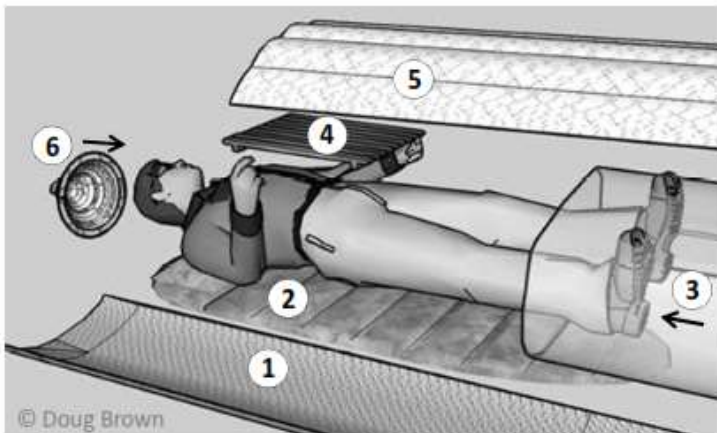
#### Appendix E: Practical Tips for Rewarming HT II & III (moderate & severe)

(from Tintinalli's Emergency Medicine 8<sup>th</sup> Ed.<sup>3</sup> with permission)

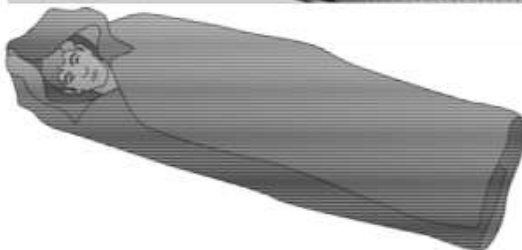
##### Hospital Resuscitation Checklist:

- Cardiac monitor & careful handling
- Core temperature monitoring (esophageal, rectal or bladder)
- If cardiac arrest, ventricular dysrhythmia, core temp <28°C or unstable:
  - do not stop resuscitation, seek expert consultation (see Appendix B & C)
  - potential for good outcome despite prolonged resuscitation, ideally transfer to ECMO center if indicated
- Minimally invasive rewarming:
  - Hypothermia burrito (see below, preference for forced air warming blankets)
  - +/- Bladder lavage  
(3-way Foley, 40°C saline, 2-4 L/hr by gravity)  
[confirm volume in = volume out, will invalidate bladder and rectal temperature measurements]
- IV Fluid Resuscitation: (crystalloid, 38-42°C)
  - Titrate fluids to clinical volume status (avoid over-resuscitation)
  - 10-20 mL/kg (~1L) to start (may be reasonable)
  - Additional 10-20 mL/kg per ~3°C core temp increase (may be required)
- Hypothermia is NOT a contraindication to airway management
- Avoid hyperoxia (titrate FIO<sub>2</sub> to 92-98%)
- If central venous access is required, keep the tip of the catheter (and guidewire) far from the heart (femoral, shallow internal jugular or shallow subclavian)
- Avoid vasopressors during early resuscitation (relative hypotension may be physiologic depending on core temperature, consider expert consultation)

##### Minimally Invasive Rewarming: (hypothermia burrito)



- 1 Outer wind & waterproof +/- reflective tarp (prehospital only)
- 2 Insulation or heating pad\*
- 3 Replace wet clothes if practical, otherwise wrap patient in plastic
- 4 Forced air, chemical or electrical heating device(s)\*
- 5 Insulating blanket
- 6 Insulate the head\*\*



\* To avoid burns, keep heating device temperatures <~40°C.

\*\*If in cardiac arrest, do not apply heat to the head (allow warm oxygenated blood to rewarm the brain centrally).