NEUROSCIENCE TEMPERATURE MANAGEMENT GUIDELINES FOR PATIENTS WITH SUBOPTIMAL TEMPERATURES AND HYPOTHERMIA

1. ASSESS SEVERITY OF LOW TEMPERATURE:

- **SUBOPTIMAL** Temperature — 35.1-36.4 degrees Celsius (95.18 - 97.5 degrees F)
  Notify licensed independent practitioner (LIP) and initiate *passive rewarming interventions*: provide warm drinks if alert and clinical status does not preclude, increase ambient room temperature, apply warm blankets, provide heated humidified oxygen to airway.

  If LIP determines Forced Air Warming (FAW) is advised, patient will be upgraded to ICU (Intensive Care Unit) level of care which may be provided on the 4 West Variable Acuity Unit or in the Neuroscience Intensive Care Unit (NSICU).

  If patient is symptomatic *(see below)* and the Neurocritical Care (NCC) Team is not actively involved, the primary team should consider requesting a formal NCC consultation.

  When ICU level of care (4 West or NSICU setting) --If despite passive rewarming interventions patient is symptomatic (*see below*) or patient expresses continued discomfort from low temperature, FAW device utilization may be considered.

- **MILD Hypothermia** — 32-35 degrees Celsius (89.6 - 95 degrees F)
  If asymptomatic notify LIP and patient may remain in current level of care (medical-surgical, stepdown or intensive care) and initiate passive rewarming interventions above.

  If Neurocritical Care (NCC) Team is not actively involved, the primary team should request a formal NCC consultation. If NCC determines FAW is advised, patient will be upgraded to ICU level of care which may be provided on the 4 West Variable Acuity Unit or in the NSICU.

  If symptomatic notify LIP and initiate passive rewarming interventions above, then if not already ICU status, consult NCC and facilitate transfer to ICU level of care (4 West or NSICU setting) for FAW or other rewarming device utilization.

  Symptomatic clinical findings include excessive shivering, hypertension, tachycardia, tachypnea, hyperventilation, confusion, apathy, drowsiness, amnesia, dysarthria, ataxia, diuresis, vasoconstriction
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- **MODERATE Hypothermia** — 28-32 degrees Celsius (82.4 - 89.6 degrees F)
  Notify LIP and initiate passive rewarming interventions above, then if not already in the NSICU, consult NCC, upgrade to ICU status and facilitate transfer to the NSICU for FAW or other rewarming device utilization.

  Clinical findings include atrial dysrhythmias, bradycardia, hypotension, hypoventilation, bradypnea, hyporeflexia, pupillary dilatation, appearance of J wave, extinction of shivering, diminished gag reflex, stupor*

  **The J point marks the end of QRS and onset of ST segment of ECG. A J wave appears as a long slow deflection not typically found on a normal ECG.*

- **SEVERE Hypothermia** — less than 28 degrees Celsius (< 82.4 degrees F)
  Notify LIP and initiate passive rewarming interventions above, then if not already in the NSICU, consult NCC, upgrade to ICU status and facilitate transfer to the NSICU for FAW or other rewarming device utilization.
  Clinical findings include ventricular dysrhythmias, asystole, apnea, nonreactive pupils, rigidity, areflexia, pulmonary edema, oliguria, coma, minimal to no EEG activity

2. CONSIDER POTENTIAL CAUSES OF HYPOTHERMIA/ SUBOPTIMAL TEMPERATURE:

   - **INTENTIONAL**: Targeted temperature management (TTM). When following TTM protocol, may utilize FAW device to assist in the control of shivering. Must also follow "Nursing actions for FAW device utilization."

   - **UNINTENTIONAL**: Accidental exposure to cold water and/or atmosphere indoors or outdoors, trauma, use/toxicity of alcohol or certain medications (the antiepileptic Clobazam or other benzodiazepines, barbiturates, opioids, sedative-hypnotics, gamma-hydroxybutyrate/GHB, ethylene glycol)

   - **PHYSIOLOGIC**: vasodilation, sepsis, malnutrition, hypothalamic dysfunction, adrenal insufficiency, endocrine disorders (diabetes, hypothyroidism), spinal cord injury, Parkinson's disease

3. CONSIDER POTENTIAL COMPLICATIONS OF HYPOTHERMIA:

   - Cardiac arrhythmias
   - Infection
   - Pulmonary edema
   - Aspiration pneumonia
   - Electrolyte imbalances—hyperkalemia, hypoglycemia
   - Bleeding diathesis—coagulation study abnormalities
   - Elevated hematocrit---resulting from volume contraction of cold diuresis
   - Bladder atony
   - Acute pancreatitis
   - Compromised tissue perfusion

NURSING ACTIONS FOR FAW DEVICE UTILIZATION

1. Minimum documentation**:**
   - **Nursing note** including the patient's low temperature at time of discovery, symptoms found *(see list provided)*, all interventions, and any adverse patient responses. *(A smart phrase has been created for ease of use).*
   - **Thermoregulation tab** rows including temperature source, intervention mode (i.e., Bair Hugger), and intervention start and end times. Shivering assessment must also be completed if warming device is being used for management of shivering.
   - **Vital signs** must be recorded as follows: temperature every 15 minutes for the first hour then hourly for duration of intervention and hourly for 4 hours once warming device removed; heart rate, respiratory rate and blood pressure every 15 minutes for the first hour then hourly for duration of intervention; cardiac rhythm strip at initiation of FAW and with any significant changes.
   - **Intake/Output (I/O)** must be recorded accurately each hour.

2. Minimum monitoring:
    - Provide **continuous cardiac monitoring**, with appropriate alarms activated. *Hypothermia and rewarming can cause many tachy- and brady- arrhythmias.*
    - Monitor **blood pressure every 15 minutes for the first hour** then at least **hourly for duration** of FAW device use, with appropriate alarms activated. *Rewarming too quickly can cause vasodilation and hypotension.*
    - Monitor and document core **body temperature** (or oral temperatures if core temperatures not available) at least **every 15 minutes for first hour** then at least **hourly for duration** of FAW device use and **hourly for 4 hours once device removed**; *continuous monitoring preferred.*
    - **Assess skin** for signs of overexposure to FAW device heat **every 15 minutes for first hour**, then at least **hourly for duration** of FAW device use. Consider whether or not patient can sense and communicate any discomfort and increase assessments accordingly. Remove FAW device if skin is being compromised by overexposure to heat source. Notify LIP and initiate passive rewarming interventions as needed to manage hypothermia.
    - Monitor **hourly I/O**. *Hypothermia can cause renal impairment and early excessive diluted urine output, followed later by reduced urine output.*

3. Utilize consistent method and anatomical site for core temperature monitoring (bladder, rectal, esophageal, pulmonary artery catheter), with appropriate alarms activated. If core temperature measurement not available nor advised by LIP, may utilize oral temperature measurements. *Axillary temperatures are not advised*.

4. Follow manufacturer's recommendations for set up and use of FAW. Monitor for potential adverse reactions to rewarming.

5. Implement measures to prevent thermal injury per manufacturer's guidelines. Place the perforated side of the FAW blanket directly in contact with the patient's skin, ensuring that the patient's head and airway are not covered. Do not allow the warming hose to contact the patient's skin.

6. Do not use FAW blanket directly over transdermal medications. *FAW blanket use may increase medication absorption.*

7. Do not apply FAW blanket over ischemic extremities. *Direct heat to ischemic limbs increases the risk of thermal injury.*

8. Do not place the FAW blanket directly over a dispersive electric pad which may generate heat such as cautery pads.

9. Adjust temperature setting of FAW device as indicated by steady increase or decrease in patient's temperature, to prevent over- or under-warming. Ambient temperature setting of FAW device may be used as patient's temperature normalizes. If elevated (above desired) temperatures are noted, discontinue FAW device use and initiate passive rewarming interventions as needed to manage hypothermia.

10. Remove FAW device once patient's temperature normalizes and is maintained.

11. Continue to monitor patient as outlined earlier for appropriateness of FAW blanket re-application to maintain normal temperature and prevent adverse effects of low patient temperatures.