
The "Cool" Group:
Total Body Cooling
January 2014

Objectives

- Define Hypoxic Ischemic Encephalopathy and outcomes;
- Verbalize understanding of the physiology of hypothermia, potential complications, and nursing considerations of TBC;
- Verbalize understanding of the eligible patient population and exclusion criteria for TBC;
- Verbalize the process for cooling, maintenance of cooling, and re-warming for TBC patients utilizing Criticool cooling system; and
- Describe the appropriate documentation process for the patient on TBC.

Statistics

Incidence is 1-2/1000 term infants

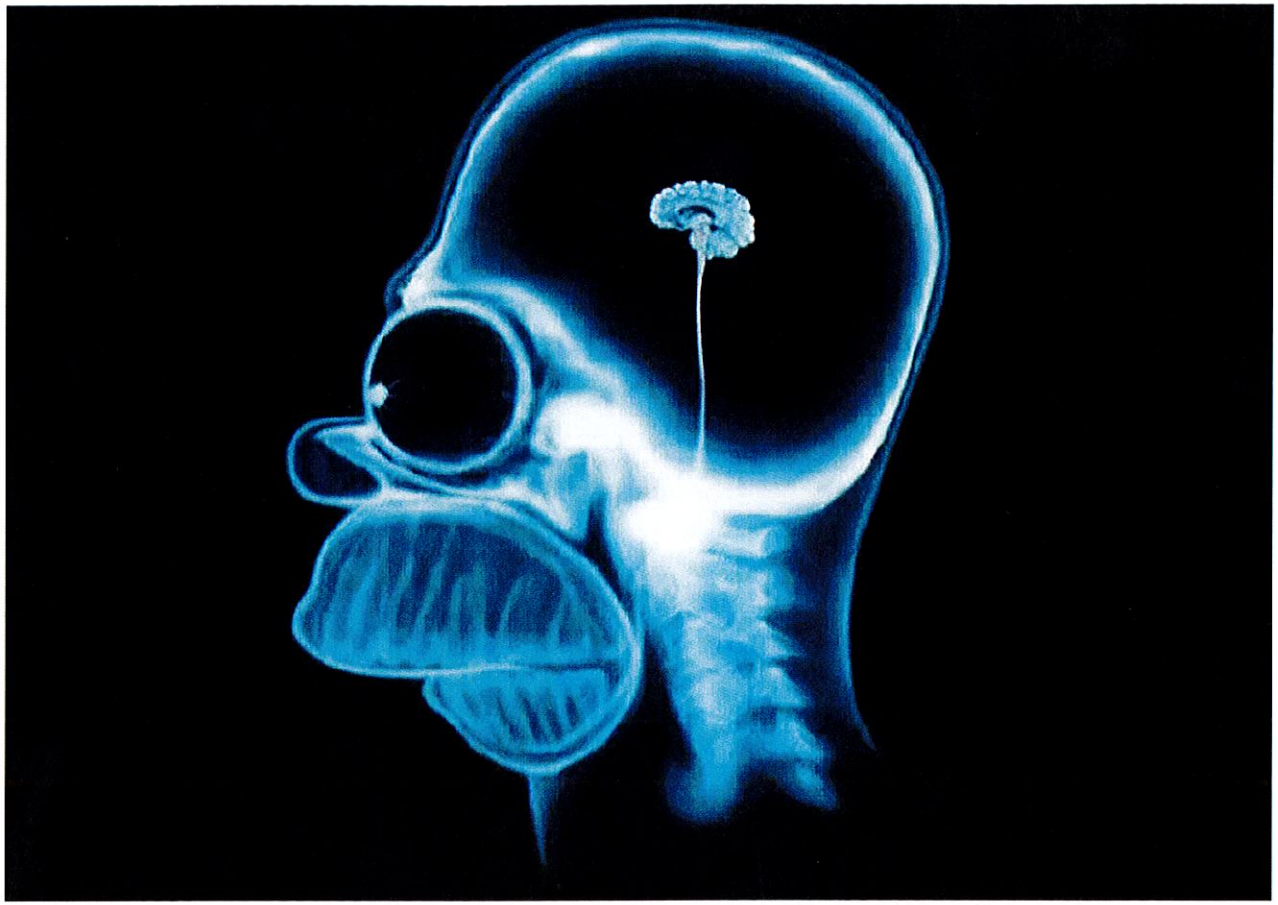
	Death	Disability
Mild	0%	0%
Moderate	10%	30%
Severe	60%	100%

(Verklan, 2009)

Statistics

- 20% are related to antepartum events.
- 35% are related to intrapartum events.
- 35% are a combination
- 10% occur in the Neonatal period.

Pathophysiology of Hypothermia



Nursing

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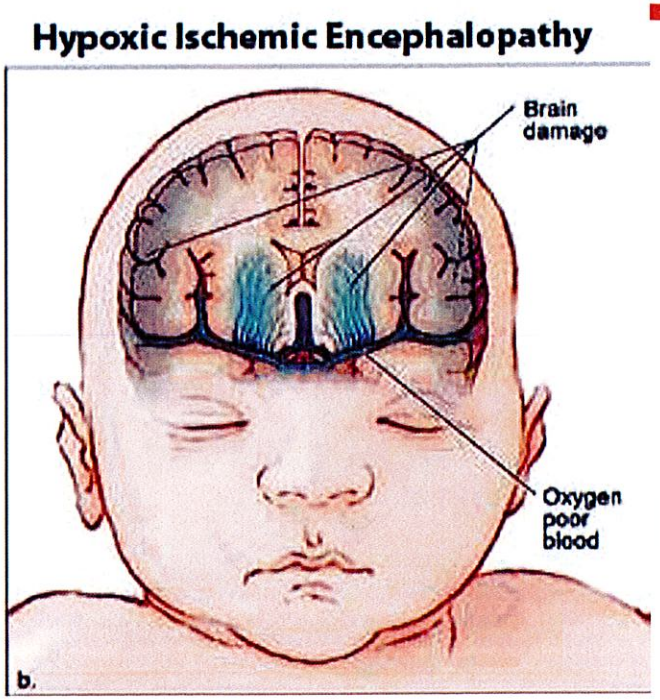


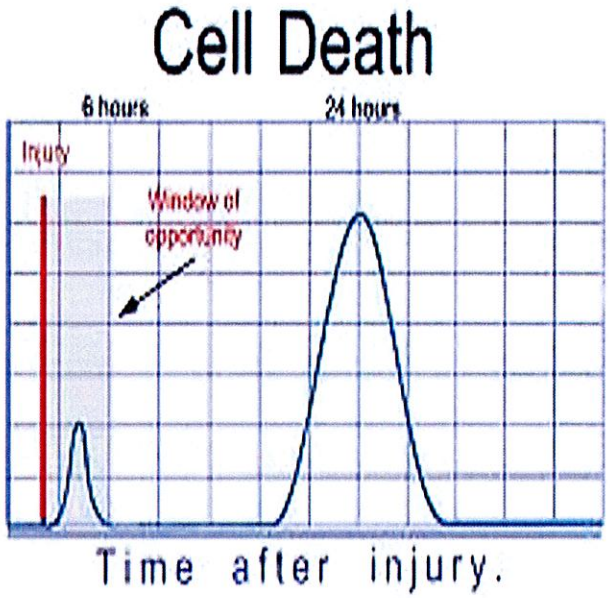
Pathophysiology of HIE

Hypoxemia + Ischemia = HIE

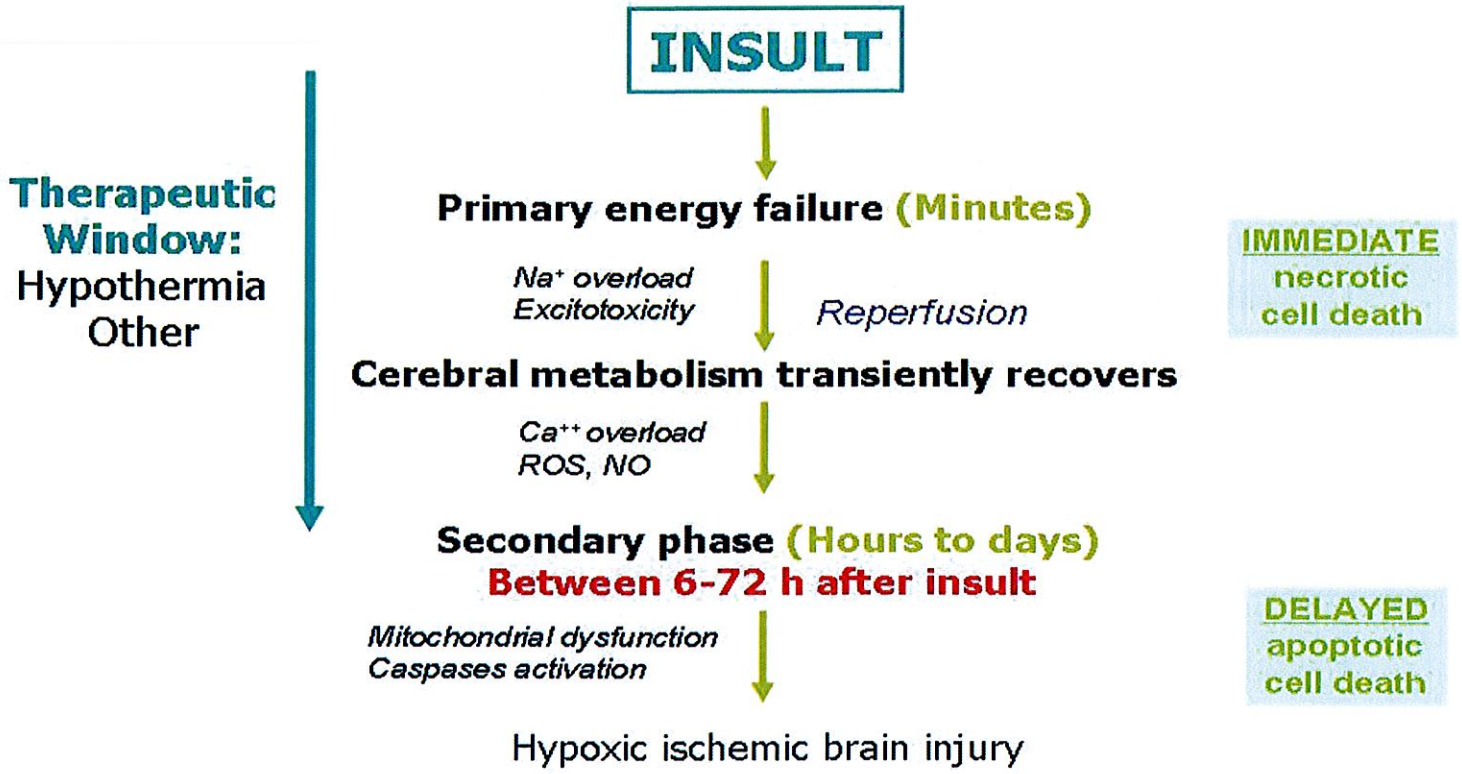
- Hypoxemia is a decrease in the amount of O_2 circulating in the blood.
- Ischemia is a decrease in the flow of blood available to perfuse the brain.
- HIE is the resultant condition from deprivation of O_2 and glucose to the brain.

Pathophysiology of HIE

- HIE leads to a cascade of deleterious events resulting in cell death.
- Two fundamental modes of cell death occur— ***necrosis*** and ***apoptosis***.
- Hypoxic ischemic insults may lead to necrosis or apoptosis, or both.



Pathophysiology of HIE



Interventions NEED TO BE WITHIN 6 hrs of insult

Pathophysiology of Hypothermia

- Neuroprotective effect first noted in mid-1950s.
- Reinforced by reports of hypothermic near-drowning victims.
- Many animal and human studies have shown benefits of hypothermia and importance of timing.
- 5 large RCTs enrolling 1117 infants
- Until recently, care has been supportive.

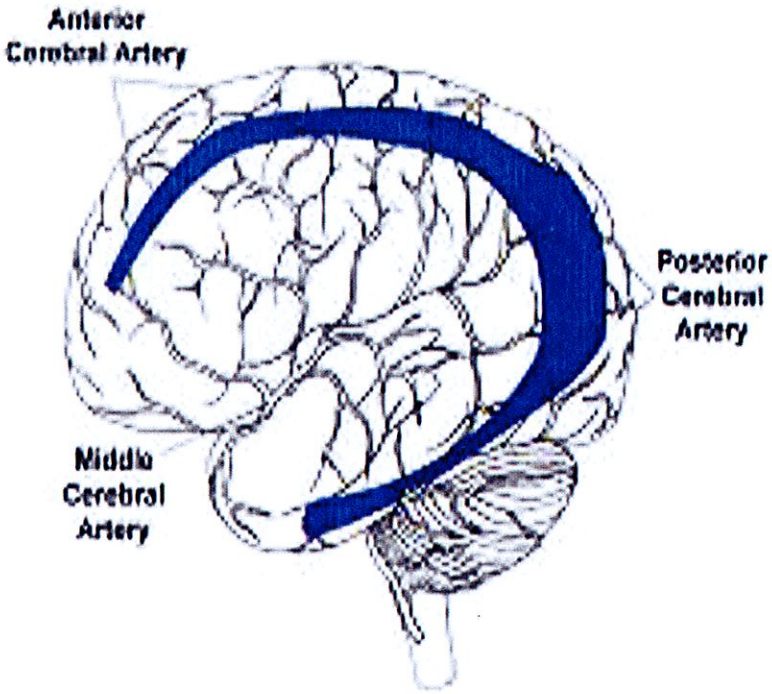
(Pfister & Soll, 2009)

Pathophysiology of Hypothermia

- Neuroprotection
- Interrupts cellular death cascade and prevents secondary injury.
- Decrease metabolic rate
- Decrease O2 consumption
- Effective strategy to reduce death and moderate to severe neurodevelopmental disability
- Studies show improved neurological assessments at 18 months of age.

Pathophysiology of Hypothermia

- Primary Damage
  - Basil Ganglia: Movement
  - Thalamus: Communications
  - Cortical "Watershed" Area



Criticool Body Cooling System

- Use regular tap water only!
- Allow water to flow into blanket prior to wrapping infant
- Use one blanket per patient

Cooling/Rewarming

- 72 hour Cooling Time Frame
  - Cooling: Criticool unit will automatically cool to set Temp 33.5
- Rewarming
  - Criticool unit will automatically rewarm to 36.5 in warming mode

TCH Protocol

INCLUSION CRITERIA

- History of acute perinatal event;
- 10 minute Apgar score of ≤ 5;
- Cord pH or any postnatal blood gas at ≤ 1 hour of age ≤ 7 or BD ≥ 16;
- Continued need for ventilation @ 10 minutes;
- Gestational age ≥ 36 weeks; and
- Birth weight 1800 grams.

EXCLUSION CRITERIA

- Inability to initiate cooling within 6 hours of age;
- Presence of known chromosomal anomaly;
- Presence of major congenital anomaly;
- Severe IUGR (BW < 1800 grams); and
- Situations in which no additional intensive therapy will be offered.

TCH Protocol

Transport

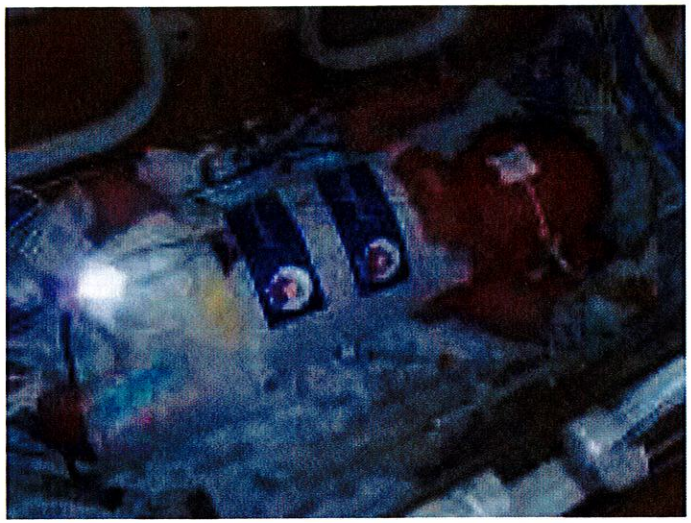
- HIE patients are first priority when triaging due to the 6 hour window.
- Families will be given Education Material.
- Active cooling with Criticool cooling system.
- Rectal probe used during transport.

  -Rectal temps will be documented every 15 minutes during transport.

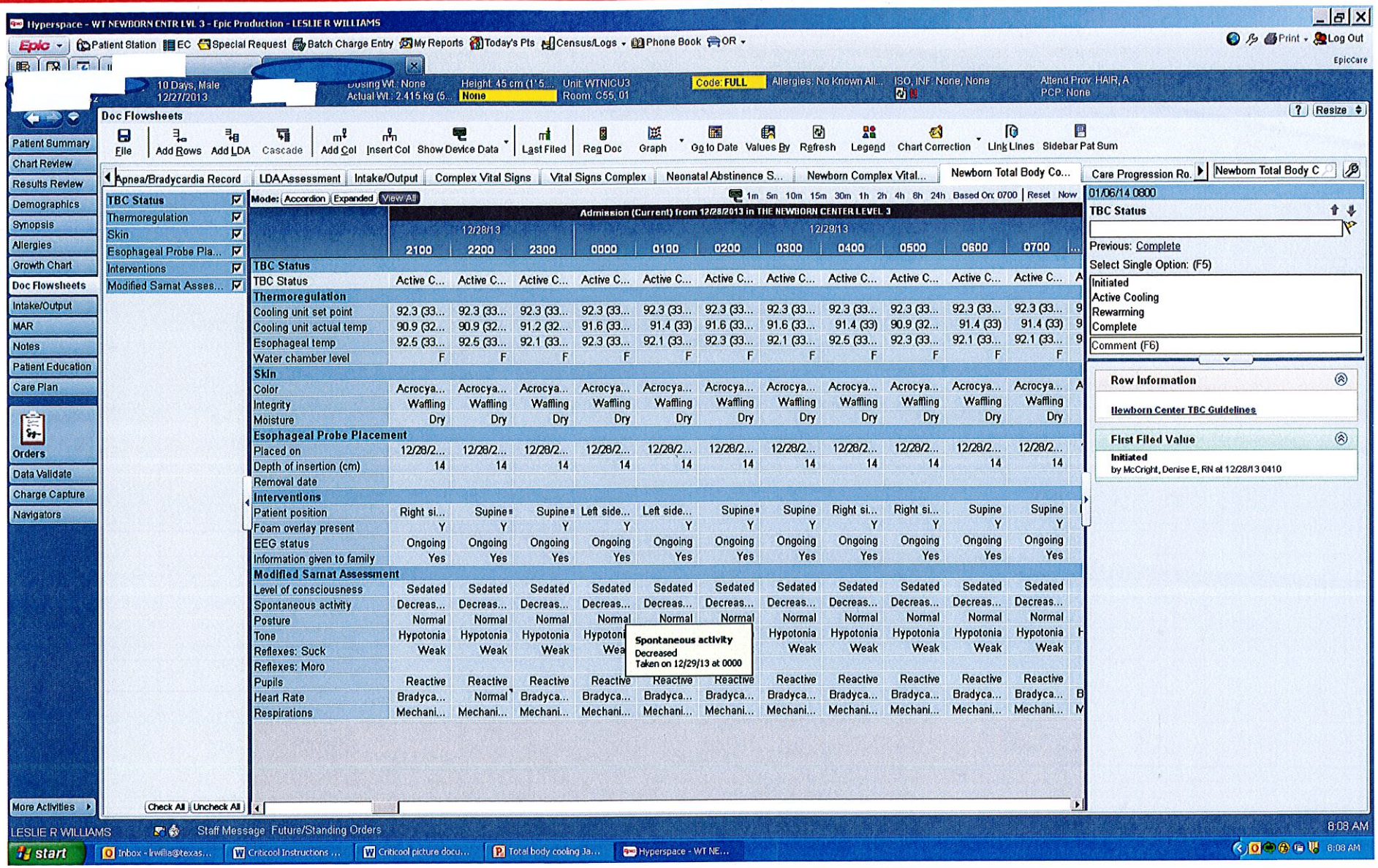
TCH Protocol

- Within 6 hours of birth, eligible infants will begin cooling and maintain a esophageal temp of 33.5° C.
- Insert esophageal temp probe on admission:
  - Nasal
  - Nose > earlobe > xyphoid Process – 2 cm.
  - X-ray confirmation.
- No external heat sources

Nursing Documentation



- HR, RR, invasive BP, & O2 sat Q 1 hour
- Urine output Q 1 hour
- Skin, esophageal and cooling unit temperatures Q 15 minutes x 4 hours, then hourly until DC'd.
- Glucose Q 1 hour



Nursing

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Nursing Documentation Modified Sarnat Scoring

- Neuro Assessment Q 4 hour

Table 1. Criteria for Defining Moderate and Severe Encephalopathy.

Category	Moderate Encephalopathy	Severe Encephalopathy
Level of consciousness	Lethargic	Stupor or coma
Spontaneous activity	Decreased activity	No activity
Posture	Distal flexion, complete extension	Decerebrate
Tone	Hypotonia (focal or general)	Flaccid
Primitive reflexes		
Suck	Weak	Absent
Moro	Incomplete	Absent
Autonomic system		
Pupils	Constricted	Deviated, dilated, or nonreactive to light
Heart rate	Bradycardia	Variable
Respiration	Periodic breathing	Apnea

Nursing Care

- Developmental Positioning
- Standard NICU care: (X-Ray)
- Continuous EEG monitoring

Nursing Care: EEG

- HAPUs
- EEG tech rounding twice a shift
  - 8am-10am
  - 5pm-7pm
- Bedside RN will assess skin and site with EEG tech
- WOC consult for suspected HAPU

Nursing Considerations

- Decreased HR (80-120 bpm; Parameters 60-140 bpm)
  - Prolonged QT interval
- Diuresis
  - Shifts in electrolytes
  - Freq monitoring and supplementation
- Insulin resistance
  - Tight glucose control
- Shifts in BP during cooling and rewarming
  - Reduced CO and SV
  - Pressers
- Increased oxygen consumption
- Shivering

(Selway, 2010)

Nursing Considerations

- Cardiac arrhythmias
  - Check Electrolytes
- Persistent acidosis
- Major thrombosis or bleeding
  - Decreased Platelet Function
  - Increased Blood Viscosity
- Skin breakdown
  - SQ Fat Necrosis

TCH Protocol

- Criticool system will Re-warm automatically at 0.4°C per hour
- Avoid complications of aggressive rewarming
  - Seizures
  - Vasodilation
    - Hypotension
  - Increasing Metabolic demands
    - Tissue hypoxia
    - Acidosis
    - Hypoglycemia

References

Pfister, RH & Soll, RF, (2009). Hypothermia for the treatment of infants with hypoxic-ischemic encophelopathy. *Journal of Perinatology*; 30, S82-S87.

Selway, LD, (2010). State of the science: Hypoxic ischemic encephalopathy and hypothermic interventions for neonates. Foundations in Newborn Care; 10 (2): 60-66.

Verklan, M.T. (2009). The chilling details: Hypoxic-ischemic encephalopathy. J*ournal of Perinatal Neonatal Nursing*; 23, (1): 59-68.