



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 rewarming for TBC patients utilizing Criticool cooling system; and
- Describe the appropriate documentation process for the patient on TBC.

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Statistics

Incidence is 1-2/1000 term infants

	<u>Death</u>	<u>Disability</u>
Mild	0%	0%
Moderate	10%	30%
Severe	60%	100%

(Verklan, 2009)

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Statistics

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

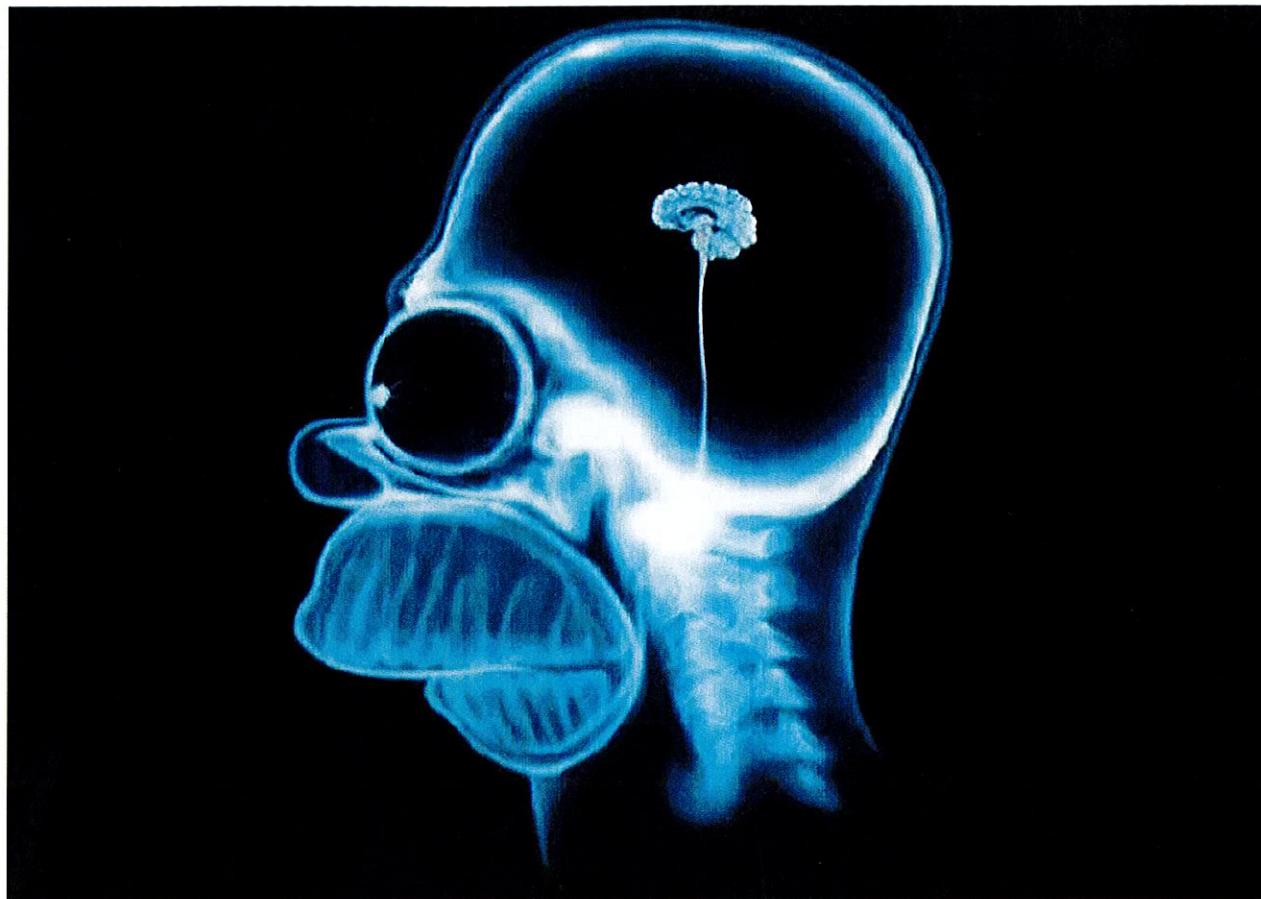


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Pathophysiology of Hypothermia

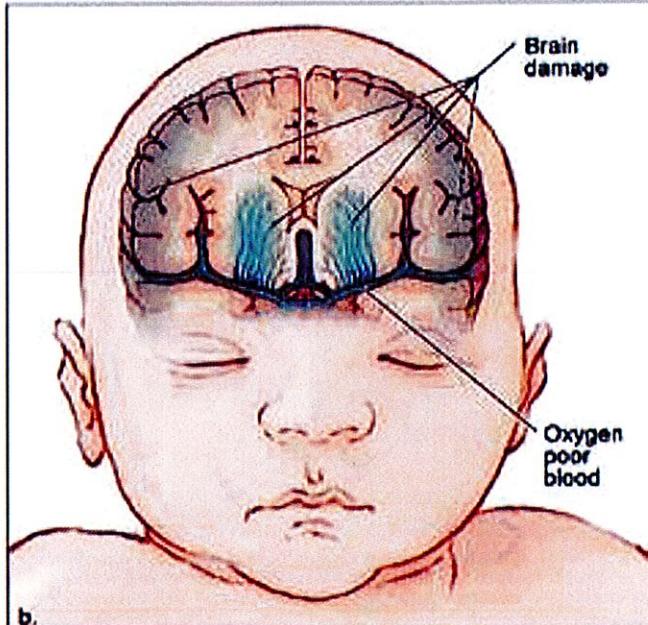


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Hypoxic Ischemic Encephalopathy



Pathophysiology of HIE

Hypoxemia + Ischemia = HIE

- Hypoxemia is a decrease in the amount of O₂ 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 O₂ and glucose to the brain.

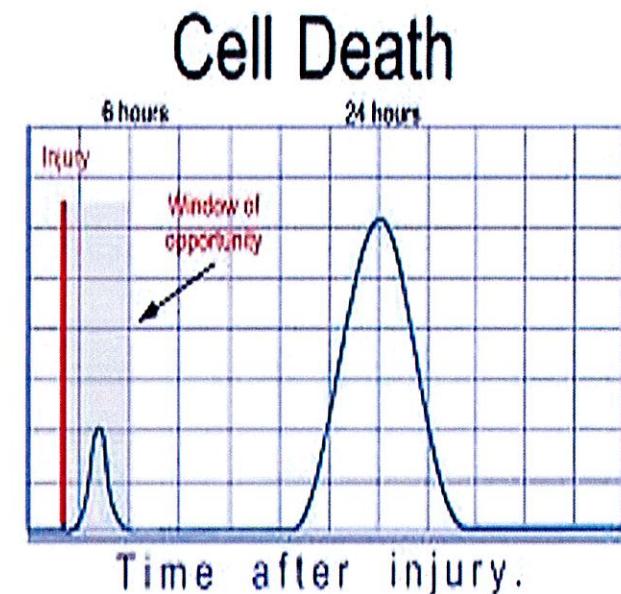
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Pathophysiology of HIE

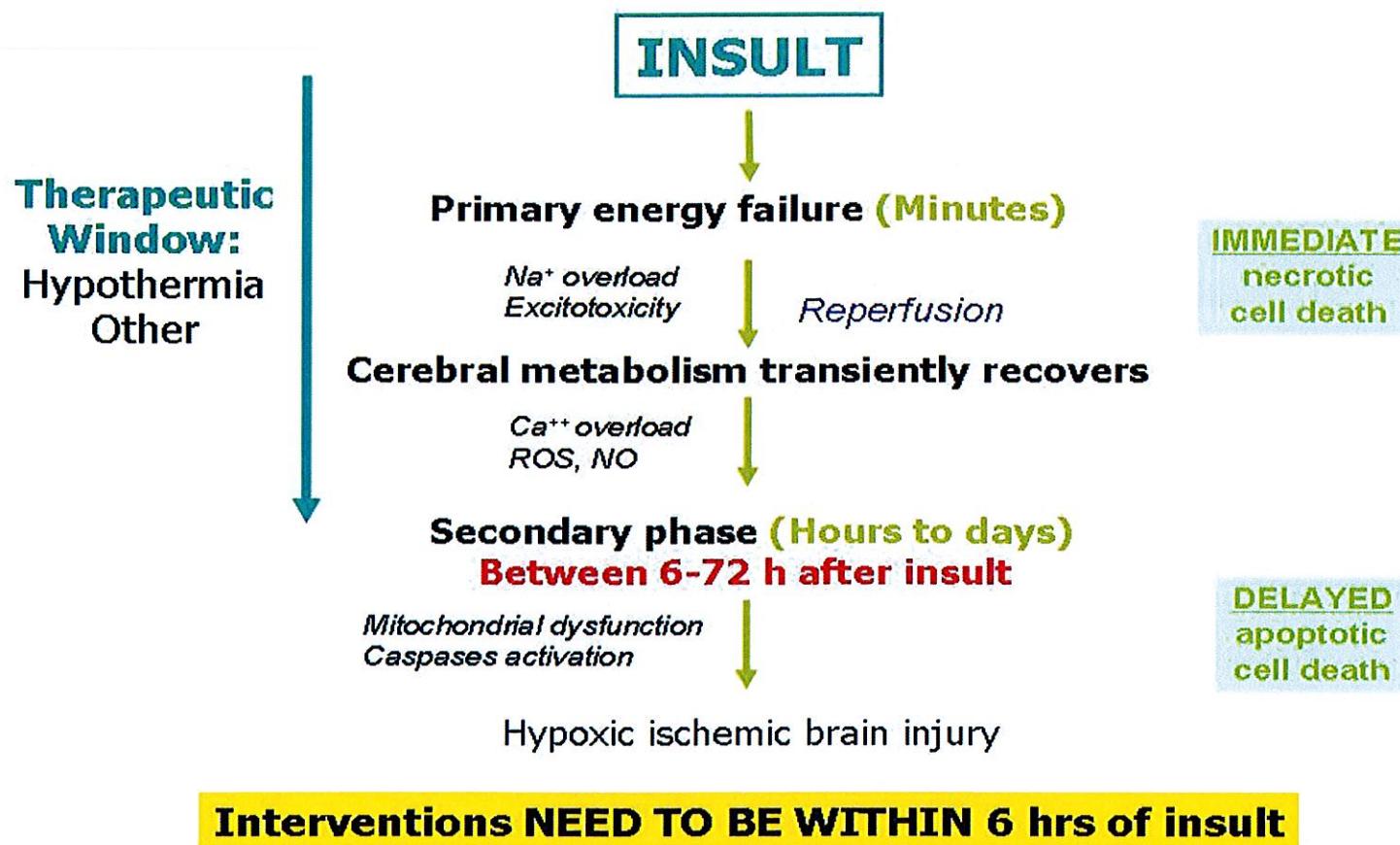
- HIE leads to a cascade of deleterious events resulting in cell death.
- Two fundamental modes of cell death occur— ***necrosis*** and ***apoptosis***.
- Hypoxic ischemic insults may lead to necrosis or apoptosis, or both.



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Pathophysiology of HIE



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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

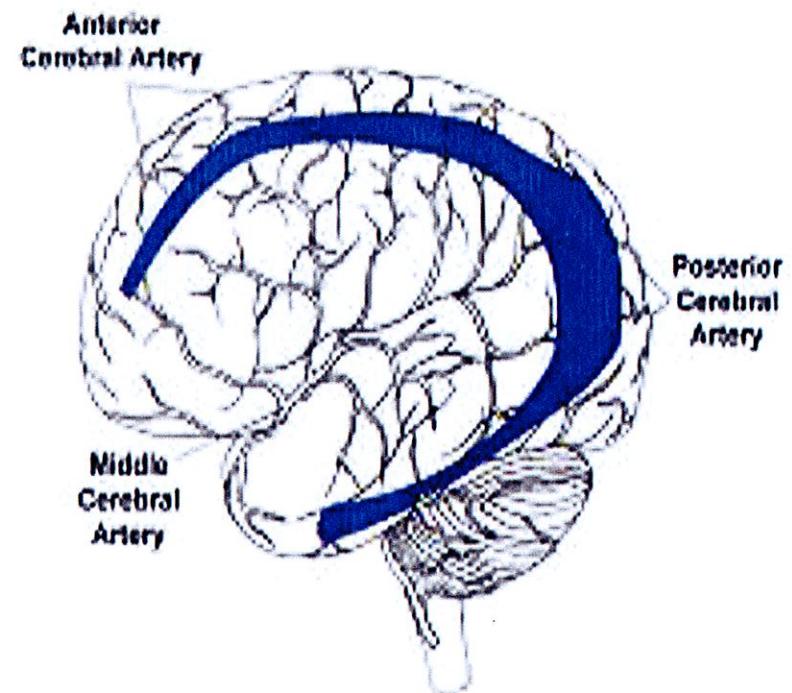
- Neuroprotection
 - Interrupts cellular death cascade and prevents secondary injury.
 - Decrease metabolic rate
 - Decrease O₂ consumption
 - Effective strategy to reduce death and moderate to severe neurodevelopmental disability
 - Studies show improved neurological assessments at 18 months of age.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

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Pathophysiology of Hypothermia

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



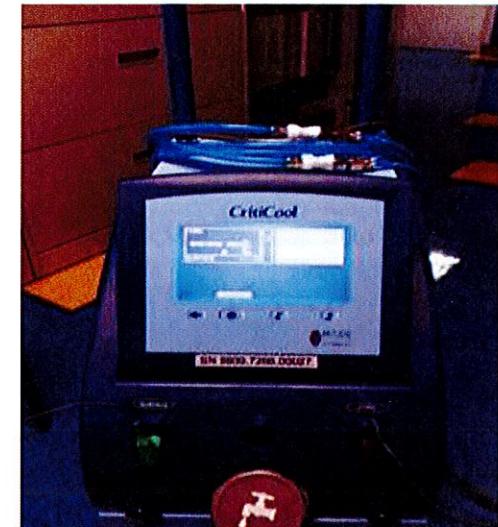
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Criticool Body Cooling System

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



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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

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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.

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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.

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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

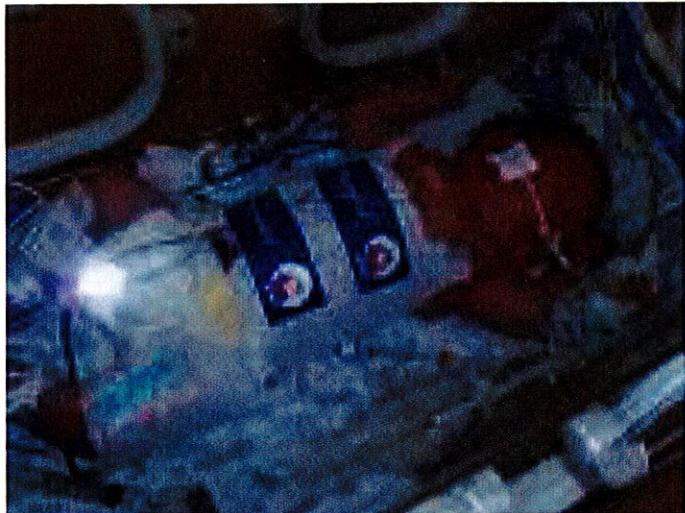


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Nursing Documentation



- 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

Hyperspace - WT NEWBORN ENTR LVL 3 - Epic Production - LESLIE R WILLIAMS

Patient Station EC Special Request Batch Charge Entry My Reports Today's Pts Census/Logs Phone Book OR

Epic Print Log Out EpicCare

10 Days, Male 12/27/2013 Dosing Wt: None Height: 45 cm (1'5") Unit: WTNICU3 Actual Wt: 2.415 kg (5... Room: C55, 01 Code: FULL Allergies: No Known All... ISO, INF: None, None Attend Prov: HAIR, A PCP: None

Doc Flowsheets

Patient Summary Chart Review Results Review Demographics Synopsis Allergies Growth Chart Doc Flowsheets Intake/Output MAR Notes Patient Education Care Plan Orders Data Validate Charge Capture Navigators

Apnea/Bradycardia Record LDAAssessment Intake/Output Complex Vital Signs Vital Signs Complex Neonatal Abstinence S... Newborn Complex Vital... Newborn Total Body Co...

TBC Status Thermoregulation Skin Esophageal Probe Pla... Interventions Modified Saman Asses...

Mode: [Accordion] Expanded View All

12/28/13 12/29/13

	2100	2200	2300	0000	0100	0200	0300	0400	0500	0600	0700
TBC Status	Active C...										
Thermoregulation											
Cooling unit set point	92.3 (33...	92.3 (33...	92.3 (33...	92.3 (33...	92.3 (33...	92.3 (33...	92.3 (33...	92.3 (33...	92.3 (33...	92.3 (33...	92.3 (33...
Cooling unit actual temp	90.9 (32...	90.9 (32...	91.2 (32...	91.6 (33...	91.4 (33...	91.6 (33...	91.6 (33...	91.4 (33...	90.9 (32...	91.4 (33...	91.4 (33...
Esophageal temp	92.5 (33...	92.5 (33...	92.1 (33...	92.3 (33...	92.1 (33...	92.3 (33...	92.1 (33...	92.5 (33...	92.3 (33...	92.1 (33...	92.1 (33...
Water chamber level	F	F	F	F	F	F	F	F	F	F	F
Skin											
Color	Acrocy... Waffling										
Integrity											
Moisture	Dry										
Esophageal Probe Placement											
Placed on	12/28/2...	12/28/2...	12/28/2...	12/28/2...	12/28/2...	12/28/2...	12/28/2...	12/28/2...	12/28/2...	12/28/2...	12/28/2...
Depth of insertion (cm)	14	14	14	14	14	14	14	14	14	14	14
Removal date											
Interventions											
Patient position	Right si...	Supine =	Supine =	Left side...	Left side...	Supine =	Supine	Right si...	Right si...	Supine	Supine
Foam overlay present	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
EEG status	Ongoing										
Information given to family	Yes										
Modified Saman Assessment											
Level of consciousness	Sedated										
Spontaneous activity	Decreas...										
Posture	Normal										
Tone	Hypotonia										
Reflexes: Suck	Weak										
Reflexes: Moro	Reactive										
Pupils	Bradyca...	Normal	Bradyca...								
Heart Rate	Mechani...										
Respirations	Mechani...										

Spontaneous activity
Decreased
Taken on 12/29/13 at 0000

More Activities Check All Uncheck All

LESLIE R WILLIAMS Staff Message Future/Standing Orders 8:08 AM

Inbox - lkwilla@texas... Critical Instructions... Critical picture docu... Total body cooling Ja... Hyperspace - WT NE...

start 8:08 AM

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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



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Nursing Care: EEG

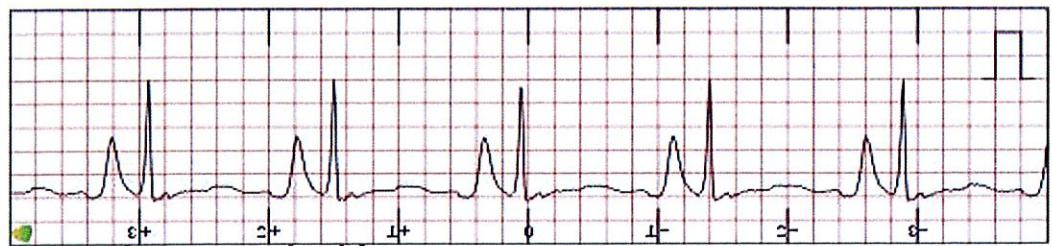
- HAPUs
 - EEG tech rounding twice a shift
 - 8am-10am
 - 5pm-7pm
 - Bedside RN will assess skin and site with EEG tech
 - WOC consult for suspected HAPU
-

Nursing



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



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(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

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References

Pfister, RH & Soll, RF, (2009). Hypothermia for the treatment of infants with hypoxic-ischemic encephalopathy. *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. *Journal of Perinatal Neonatal Nursing*; 23, (1): 59-68.