State of Florida Hypothermia Protocol

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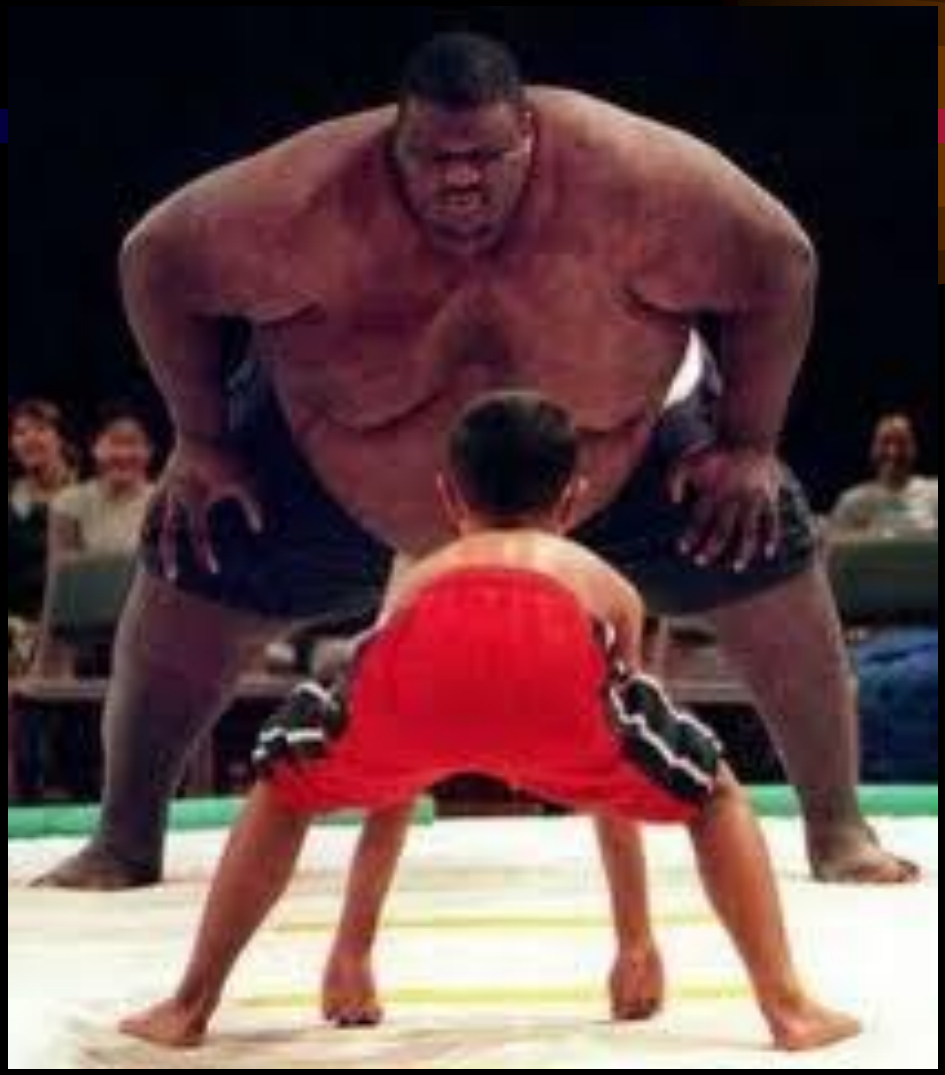

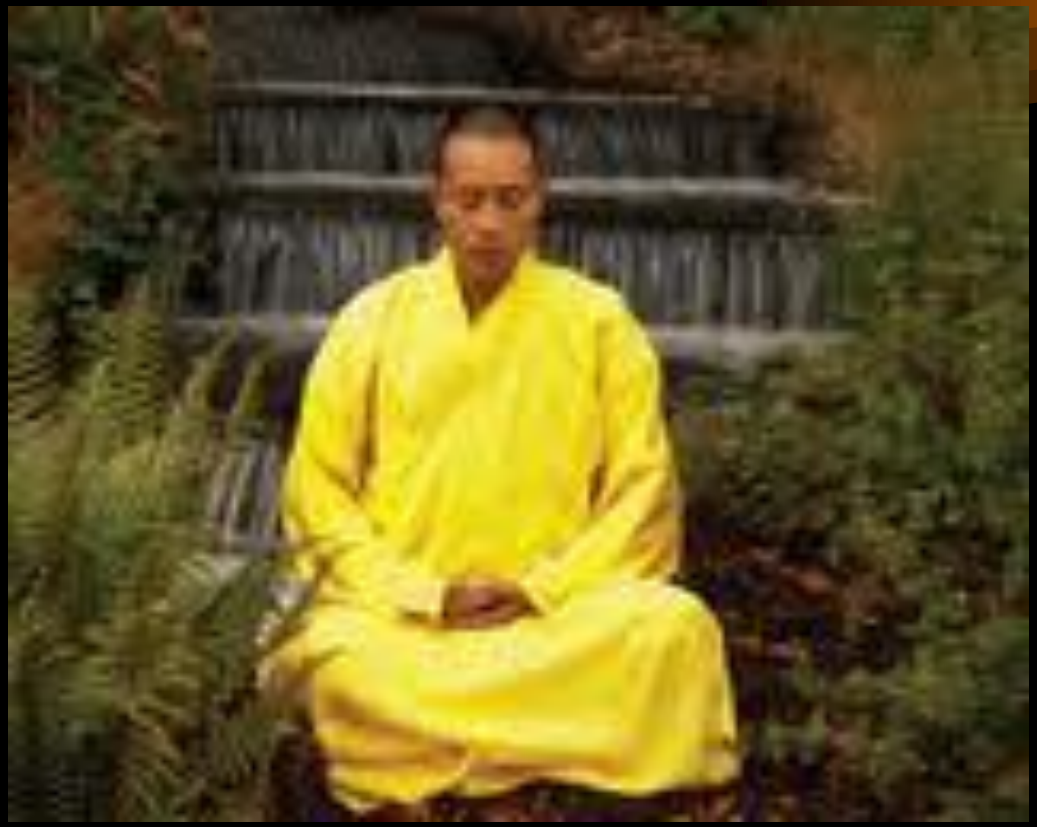

I. Entry Criteria

1. Gestational Age greater than or equal to 35 weeks gestation
2. Birth weight greater than or equal to 1.8 kg
3. less than or equal to 6 hours since insult occurred

Ia. Entry Criteria-Neurologic Exam

4. **Seizures or 3 of 6 of the following:**

Clinical Criteria	**Signs of Encephalopathy**	
	Moderate Encephalopathy	**Severe Encephalopathy**
1. Level of consciousness	Lethargic	Stupor/coma
2. Spontaneous activity	Decreased activity	No activity
3. Posture	Distal flexion, complete extension, frog leg posture	Decerebrate
4. Tone	Hypotonia (focal or general), hypertonia (focal or truncal).	Flaccid
5. Primitive reflexes		
Suck	Weak or bite	Absent
Moro	Incomplete	Absent
6. Autonomic system		
Pupils	Constricted	Skew deviation /dilated/non-reactive to light
Heart rate	Bradycardia	Variable
Respirations	Periodic	Apnea or intubated

***HR** *should only be used as an entry criteria if the patient in normothermic at the time of staging*

Ib. Entry Criteria- Physiologic

5. **ONE OR MORE** of the following predictors of severe HIE:

- pH less than or equal to 7.0 with base deficit of greater than or equal to16 on arterial blood gas determination (base excess more negative than -16)
- pH7.01--7.15 , base deficit 10-15.9 or no blood gas available and acute perinatal event (cord prolapse, heart rate decelerations, uterine rupture) and either
- APGAR less than or equal to 5 at 10 minutes or assisted ventilation at birth required for greater than or equal to 10 min
- Note: If an arterial blood chord or patient blood gas is not available may use a venous gas from the patient for screening criteria. Due to perfusion issues which often occur with neonates with HIE, capillary blood gases should not be used for evaluating for hypothermia.

II. Exclusion Criteria

- Presence of lethal chromosomal abnormalities
- Severe IUGR
- Significant intracranial hemorrhage with a large intracranial hemorrhage (Grade III or intraparenchymal echodensity (Grade IV))(Note: may start hypothermia without obtaining HUS if not immediately available. Should be obtained as soon as possible after the start of hypothermia.)

III. Order Set

1. Consult HIE team.
2. NPO or consider low volume feeds (trophic) depending on the clinical condition of the neonate
3. VS Q15 X4, then Q30 X2 then $Q1^0$
4. Record strict I&O
5. Place Foley catheter if urinary output is low, may remove if urine output is deemed adequate
6. Place neonate on servo-controlled cooling device (Blanketrol® III or Criticool®)

III. Order Set

7. Place indwelling rectal or esophageal temperature probe.
8. Adjust set temperature to maintain rectal temperature in the range of 33.0 to 34.0°C with a target of 33.5°C using servo-controlled cooling blanket. Notify MD or NNP if temperature falls outside this range.
9. Record rectal and axillary temperatures q hour
10. Move infant's position on the blanket q 30 minutes to avoid skin injury
11. Set lower heart rate limit at 70.

III. Order Set

12. Start a continuous opiate infusion at a low dose or intermittent dosing.
13. Laboratory and other studies

- a. Obtain Cranial ultrasound with Doppler flow to measure resistive index as soon as possible
- b. Place cerebral function monitor (aEEG) on patient or obtain continuous video EEG monitoring. Monitor for 72 hours and during rewarming.
- c. Consider echocardiogram due to neonates with HIE having cardiac dysfunction often with the need pressor support and the association of HIE with pulmonary hypertension.
- d. Consider renal ultrasound with Doppler flow if the patient has anuria or severe oliguria
- e. Arterial blood gases with lactate q 6 hours
- f. Electrolyte panel with ionized calcium, magnesium, and phosphorus now and q 12 hours while undergoing hypothermia therapy
- g. CBC with differential and platelets now and q 12 hours
- h. PT, INR, PTT, Fibrogen, D-Dimer now and q 12 hours while undergoing hypothermia therapy.

III. Order Set

- i. Urine dipstick for blood, q 24 hours while undergoing hypothermia therapy

14. Liver function test (LFTs) now and at 24 hours.

15.Accu checks- $Q1^0$ until 3 consecutive results that are appropriate, then $Q2^0$ for 4h then $Q4^0$ for 24h then $Q8^0$ for 24h.

16. Perform serial Sarnat exams and document results every 24 hours.

17. Consider placement of cerebral oximetry to assure cerebral perfusion, aid in optimization of blood pressure and assist with long-term prognosis.

- Note: if the neonate is clinically improving, the bedside clinician may consider decreasing the lab frequency. If the frequency is decreased please make sure the frequency is a multiple of the written frequency (ex. Q8 labs changed to Q16 or Q24).

IV. Rewarming

1. Electrolyte panel with ionized calcium, magnesium, and phosphorus prior to rewarming

- Call with results before re-warming and do not re-warm until electrolyte abnormalities are resolved

2. Check vital signs, make sure HR < 120 and BP mean > or = 40 Call if abnormal

3. Re-warm infant by increasing the set temperature on the servo controlled cooling blanket by 0.1-0.5 ˚C every hour until patient temperature is 36.5 degrees C, then discontinue cooling blanket. Re-warming may be restarted when the neonate has no EEG evidence of seizure activity for 1 hour.

4. During re-warming, VS q 1 hour

IV. Rewarming

5. If infant begins to have seizures during the re-warming process, stop re-warming and maintain infant at current temperature until seizures are under control
6. After re-warming is completed, manage radiant warmer per nursery routine
7. Diffusion Weighted MRI with spectroscopy at 4-5 days of life and again at 7-12 days of life.

If only 1 MRI can be obtained, it should occur at 7-12 days of life.

V. Post-warming labs

24 hours after re-warming

- 1. PT, Fibrinogen, D-Dimer
- 2. Urine dipstick for blood
- 3. CBC with differential and platelets
- 4. Electrolyte panel with ionized calcium, magnesium, and phosphorus

VII. Developmental Follow-up

- Ideally, neonates who have undergone therapeutic hypothermia should be followed closely until 2 year of age for developmental delays. Follow-up may occur by:
- *Referral to Early Steps Program*
- *Referral to Pediatric Neurology/Developmental Pediatrician/Pediatric Neuropsychologist*

VIII. Target Values for Labs

- ABG
  - Call MD or NNP if pH less than 7.35 arterial (7.3 venous) or PCO2 less than 30 mmHg
- NRB
  - Call MD or NNP if sodium less than 120, potassium less than 3, calcium less than 7, or ionized calcium less than 0.9
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VIII. Target Values for Labs

- CBC with Diff/Platelets
  - Call MD or NNP if platelet count less than 50,000
- PT, INR, PTT, Fibrinogen, D-Dimers
  - Consider therapy to maintain PT less than 19, Fibrinogen greater than 100 as hypothermia might increase the risk of coagulopathy or bleeding
  - If coagulation profile is abnormal requiring correction, follow-up in 6 hours after treatment. If normal x 2 without replacement, discontinue coagulation profile monitoring

VIII. Target Values for Labs

- Rewarming
  - NRB
    - Call MD or NNP if sodium less than 130, potassium less than 3, calcium less than 7, or ionized calcium less than 0.9
  - Check vital signs, make sure HR < 160 and BP mean > or = 35

Equipment

- Blanketrol III
- Criticool
- Cool Cap

Instructions for outside facility

- Monitor core (rectal) temperature closely (continuous or intermittent)
- Continuous rectal temperature monitoring (preferred method, if available)
  - Gently insert lubricated rectal probe to approx 6cm, tape to thigh
  - Document temperature and vital signs every 5-15 minutes (on flow sheet)

Instructions for outside facility

- Intermittent rectal temperature checks (until transport team arrives)
  - Gently insert lubricated thermometer rectally ~2cm
  - Document temperature and vital signs every 5-15 minutes (on flow sheet).

Instructions for outside facility

- **Passive Hypothermia Instructions:**
- Turn off radiant warmers.
- A target core (rectal) temperature of 33.5˚C.
- *Educational guideline:* Cooled babies have depressed metabolism, so generate less heat
- If baby has never been warmed: they are easily overcooled, even passively.

Instructions for outside facility

- If the temperature drops below 33.0˚C, turn the radiant warmer on with a temperature set at 0.5˚C above the current temperature. May increase by 0.5˚C every 30 minutes until the temperature is at the target of 33.5˚C. At this point, the radiant warmer can be discontinued. If the temperature drops below the target temperature of 33.5˚C, this procedure may be repeated.