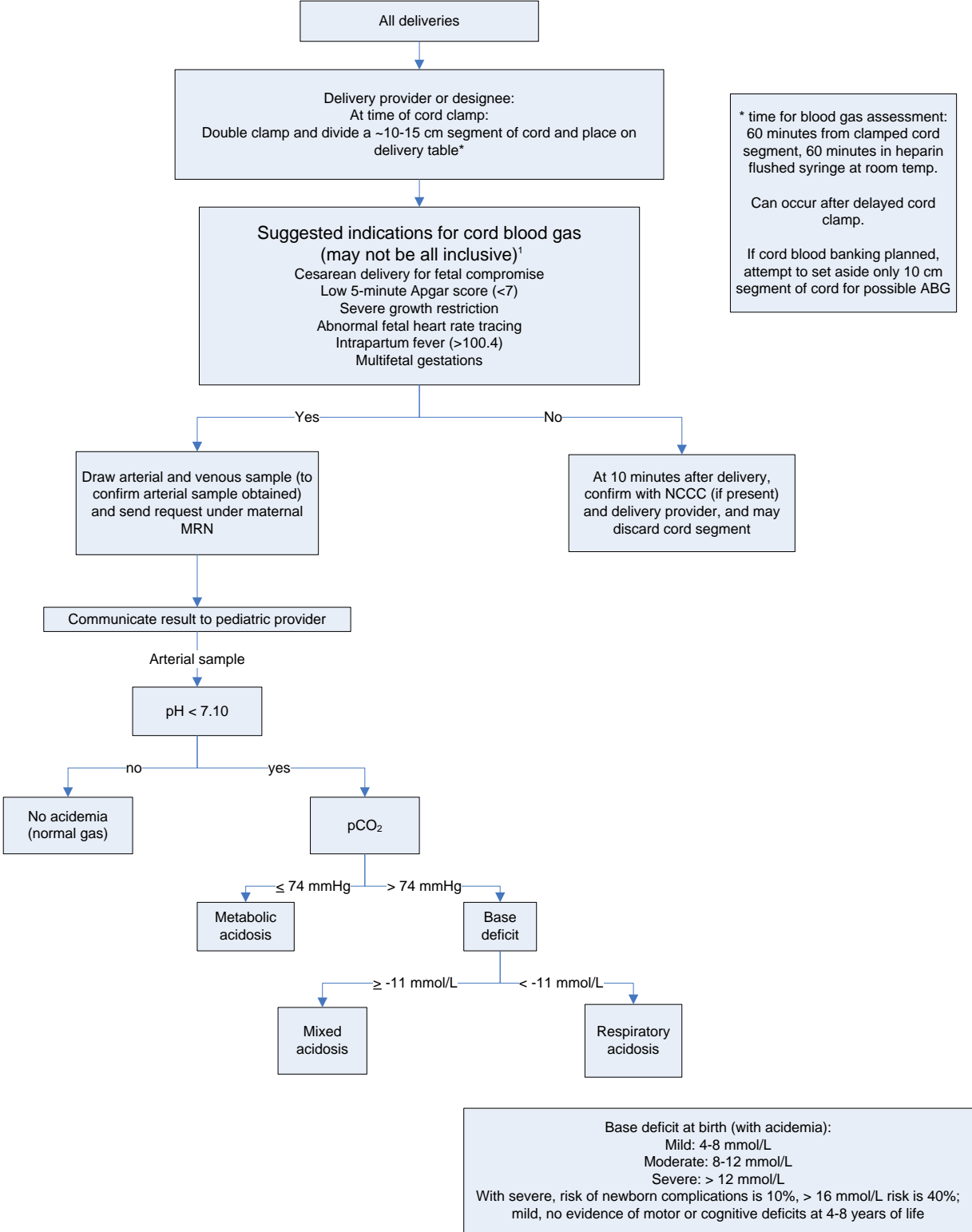


### Umbilical Cord Blood Gases: Fetal acid base assessment at time of delivery Indication and interpretation



Rationale for universal sampling:

Asphyxia affects 3-5 per 1000 births in developed countries and is felt to be responsible for hypoxic–ischemic encephalopathy (HIE) in 0.5-1.0/1000 live births. With mod/severe HIE, 10-60% of these infants die in neonatal period with 25% of survivors developing long term neurologic sequelae. Brain cooling and whole body neonatal hypothermia has been demonstrated to have a 20-30% reduction in risk of death or major disability in cases of HIE, thus identification of a neonate that would benefit from hypothermia may result in improved outcomes.

In addition, expert opinion suggests that cord blood gas analysis may be beneficial in medicolegal settings and in determining potential timing of fetal/neonatal injury.

Eligibility for therapeutic hypothermia:

UNC protocol: EGA > 36 weeks, BW > 1800 gram, < 6 hours of age (of note, absence of cord ABG will not exclude any from cooling).

**Inclusion criteria**

Infant must meet both physiologic and neurologic criteria. See attached Body Cooling Algorithm.

- A. Physiologic criteria (Blood gas is defined as: (A) a cord gas, or (B) any blood gas within the first hour of life.)
1. Blood gas pH <7 or base deficit of > 16, then proceed to neurologic criteria
  2. No blood gas or blood gas pH 7-7.15 or base deficit of 10-15.9 with an acute perinatal event (abruption placenta, cord prolapse, severe FHR abnormality: variable or late decels), plus either a or b, then proceed to neurologic criteria
    - a. A 10 minute apgar less than 5
    - b. A continued need for ventilation initiated at birth and continued for at least 10 minutes
- B. Neurologic Criteria
1. The presence of seizures is automatic inclusion
  2. Physical exam consistent with moderate to severe encephalopathy in 3 of the 6 categories

	<b><u>Neuro Exam</u></b>	<b><u>Moderate Encephalopathy</u></b>	<b><u>Severe Encephalopathy</u></b>
1	Level of Consciousness	Lethargic	Stupor or coma
2	Spontaneous movement	Decreased activity	No activity
3	Posture	Distal flexion	Decerebrate
4	Tone	Hypotonia (focal, general)	Flaccid
5	Primitive reflexes <ul style="list-style-type: none"> <li>• Suck</li> <li>• Moro</li> </ul>	Weak Incomplete	Absent Absent
6	Autonomic system <ul style="list-style-type: none"> <li>• Pupils</li> <li>• Heart rate</li> <li>• Respiration</li> </ul>	Constricted Bradycardia Periodic breathing	Dilated, nonreactive Variable Apnea

\*\*UNC NCCC protocol for body cooling for HIE

**Of note – as of 8/29/2012, absence of an umbilical cord gas will NOT exclude a child from therapeutic hypothermia, nor is a metabolic acidosis on a cord gas a sole indication for neonatal therapeutic hypothermia**

Three RCT's (all term)

- 1) CoolCap (Gluckman, 2005) – Inclusion: Peripartum HIE, mod-severe encephalopathy or seizures, with abnormal aEEG. Outcome: death or severe disability = OR for selective head hypothermia 0.61 (95 % CI 0.34,1.09); statistical improvement in subgroup with moderately abnormal EEG, but not with severe EEG changes
- 2) NICHD (Shankaran, 2005) – Inclusion: Protocol as is currently described as above for UNC NCCC indications for hypothermia. Outcome: Reduction in death or mod/severe disability with systemic hypothermia [RR 0.72 (95% CI 0.54,0.95)
- 3) TOBY (Azzopardi, 2009) - Inclusion: similar protocol as above. Outcomes: death or severe disability with systemic hypothermia RR 0.86 (0.68,1.07); Survival without neurological abnormality RR 1.57 (1.16, 2.12); cerebral palsy RR 0.67 (0.47, 0.96) - all comparisons cooled vs non cooled neonates

Meta-analysis of trials with whole body cooling: RR for death or major disability: 0.77 (0.66, 0.90) with whole body cooling.<sup>2,3</sup>

Thus, given the above issues, having the opportunity to obtain umbilical cord gas at every delivery with the ability to obtain it up to 60 minutes after delivery warrants collection of cord segment at all deliveries. However, to reduce unnecessary costs, feel lab analysis of arterial and venous cord gas at every delivery remains unjustified. A double clamped cord segment that is not used, could also then be used to add to cord blood bank collection if indicated.

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4. Gluckman PD, Wyatt, et al. Selective head cooling with mild systemic hypothermia after neonatal encephalopathy: multicenter randomized trial. Lancet 2005;365:663-70
5. Shankaran S, Laptook A, Ehrenkranz R, et al. Whole-Body Hypothermia for Neonates with Hypoxic-Ischemic Encephalopathy. N Engl J Med 2005;353:1574-84.
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***Notification to Users***

***These algorithms are designed to assist the primary care provider in the clinical management of a variety of problems that occur during pregnancy. They should not be interpreted as a standard of care, but instead represent guidelines for management. Variation in practices should take into account such factors as characteristics of the individual patient, health resources, and regional experience with diagnostic and therapeutic modalities. The algorithms remain the intellectual property of the University of North Carolina at Chapel Hill School of Medicine. They cannot be reproduced in whole or in part without the expressed written permission of the school.***

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