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

All deliveries

Delivery provider or designee:
At time of cord clamp:
Double clamp and divide a ~10-15 cm segment of cord and place on delivery table*

Suggested indications for cord blood gas (may not be all inclusive)¹
Cesarean delivery for fetal compromise
Low 5-minute Apgar score (<7)
Severe growth restriction
Abnormal fetal heart rate tracing
Intrapartum fever (>100.4)
Multifetal gestations

Yes
No

Draw arterial and venous sample (to confirm arterial sample obtained) and send request under maternal MRN
Communicate result to pediatric provider

Arterial sample
pH < 7.10

No acidemia (normal gas)

pCO₂
≤ 74 mmHg

Metabolic acidosis

Base deficit
> -11 mmol/L

Mixed acidosis

Respiratory acidosis

At 10 minutes after delivery, confirm with NCCC (if present) and delivery provider, and may discard cord segment

Base deficit at birth (with acidemia):
Mild: 4-8 mmol/L
Moderate: 8-12 mmol/L
Severe: > 12 mmol/L
With severe, risk of newborn complications is 10%, > 16 mmol/L risk is 40%; mild, no evidence of motor or cognitive deficits at 4-8 years of life

* time for blood gas assessment:
60 minutes from clamped cord segment, 60 minutes in heparin flushed syringe at room temp.
Can occur after delayed cord clamp.

If cord blood banking planned, attempt to set aside only 10 cm segment of cord for possible ABG

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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).

**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. 2,3

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.

References:


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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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