Royal Hospital for Women (RHW)
BUSINESS RULE
COVER SHEET

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SUMMARY	Collection of arterial and venous umbilical cord blood sample to provide objective information on acid-base status of the neonate at birth

Royal Hospital for Women (RHW)
CLINICAL BUSINESS RULE

Umbilical cord blood gas sampling

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1. BACKGROUND

Umbilical cord blood gas sampling is an objective determinant of fetal metabolic condition at the moment of birth. Values from the umbilical cord artery provide the most accurate information regarding fetal and newborn acid-base status. Arterial and venous cord blood gases considered together provide information on the presence, duration, and possible cause of fetal oxygen deficiency

The aim of this CBR is to explain how to safely obtain arterial and venous umbilical cord blood samples for analysis and follow up required

2. RESPONSIBILITIES

2.1 Midwifery staff:

- Recognise situations that require umbilical cord blood sampling and collect samples as per this CBR
- Notify paediatric and obstetric teams of results as required

2.2 Medical staff:

- Recognise situations that require umbilical cord blood sampling and collect samples as per this CBR
- Notify paediatric teams of results as required.

3. PROCEDURE

3.1 Clinical Practice

- Prepare equipment:
  - Umbilical cord clamps x2
  - Alcohol wipes
  - Heparinised arterial blood gas syringes (size 30) x2
  - Safety needles (21G) x2
  - Stat Strip® lactate meter strips
  - Personal Protective Equipment (PPE)

- Collect paired umbilical cord blood for gas sampling in a neonate with any of the following risk factors [1,2]:
  - Fetal scalp lactate performed intrapartum
  - Abnormal red fetal heart rate pattern
  - Instrumental birth
  - Shoulder dystocia
  - Vaginal breech birth
  - Apgars <4 at 1 minute and/or < 7 at 5 minutes
  - Emergency caesarean section
  - Suspected small for gestational age <10% or Intrauterine growth restriction
  - Preterm gestation

  - Intrapartum haemorrhage
  - Known fetal anomaly
  - Meconium stained liquor
  - Multiple birth
  - Risk of potential metabolic condition in the fetus
- Identify and clamp a 10-20cm segment of umbilical cord immediately or as soon as possible and prior to the birth of the placenta. Collect umbilical blood samples within 60 minutes of clamping the cord for accurate analysis
- Attach 21G safety needles to heparinised arterial blood gas syringes
- Affix maternal label to each syringe
- Identify one umbilical cord artery and vein
- Insert needle and withdraw a minimum of 0.2 mLs of blood from the artery first. The thickness of the vein will support the thinner artery aiding sample collection
- Recommend lactate analysis if sample is smaller than 0.2 mLs (particularly with the arterial sample)
- Close safety shield over needle whilst withdrawing from vessel
- Remove safety needle and expel any air from syringe
- Cap with stopper provided
- Invert syringe and mix specimen
- Repeat the procedure from the vein
- Analyse cord blood gases on blood gas analyser located in Birth Unit (BU) according to manufacturer's instructions. Ensure woman's correct details are entered in pH analyser enabling electronic copy of result is sent to medical record
- Print copy of the cord gas results. Attach to mounting sheet and file in medical record
- Process paired cord samples in NCC or send to pathology if BU blood gas machine is unavailable
- Inform paediatric and obstetric registrars if arterial cord gas blood result is pH <7.1, base excess > -10 or lactate ≥ 6.1mmol/L (see table 1 for normal cord gas levels)
- Asymptomatic neonates with arterial cord pH or lactate:
  - ≥ 6.1 mmol/L require repeat lactate at 2 hours of life (repeat lactate using Stat Strip® lactate meter within birth unit) along with minimum of two sets of hourly observations including pulse oximetry. Inform paediatric team of repeat lactate result and document
  - <7.0 pH should be admitted to NCC within 30 minutes of birth for four hours of continuous observation
  - 7.0-7.1 pH require a minimum of two sets of hourly observations including pulse oximetry performed in birth unit and escalated if abnormal
- Include the cord blood gas results on the obstetric database

Table 1 – Term Neonates normal cord blood gases levels

Normal cord blood gas and pH (during and post labour) at term	pH	Base excess (mmol/l)	pCO2 (mmHg)	Lactate
Umbilical Artery	7.05 - 7.38	-2.5 to -10	37 – 80	≤ 6.1mmol/L
Umbilical Vein	7.17 – 7.48	-1.0 to -9.0	26 – 59	

3.2 Documentation

- Medical record

3.3 Educational Notes

- It is imperative to clamp the cord as soon as possible after the birth as a delay may cause significant changes in the pH and gas values due to gaseous diffusion and continuing metabolism[4]

- Arterial cord blood analysis provides the most objective information on the acid-base status of the neonate at the time of birth[1]
- Venous cord blood analysis reflects a combination of maternal acid-base status and placental function[3]
- Clinicians should be mindful of maternal request for delayed cord clamping and discussion about recommendation of immediate clamping for cord gas analysis should occur if any risk factors above are present[2]
- Once the umbilical cord has been double clamped, it can be left at room temperature for 60 minutes without blood clotting or significant changes in the pH, oxygen and carbon dioxide saturations in the blood[2]
- It is acknowledged delayed cord clamping is recommended in preterm births, which may conflict with the recommended practice of cord blood gas sampling. It is encouraged that a multidisciplinary approach be taken in discussion with the paediatric team at the time of birth [4]

3.4 Implementation, communication and education plan

The revised CBR will be distributed to all medical, nursing and midwifery staff via @health email. The CBR will be discussed at ward meetings, education and patient quality and safety meetings. Education will occur through in-services, open forum and local ward implementation strategies to address changes to practice. The staff are asked to respond to an email or sign an audit sheet in their clinical area to acknowledge they have read and understood the revised CBR. The CBR will be uploaded to the CBR tab on the intranet and staff are informed how to access

3.5 Related Policies/procedures

- Fetal heart rate monitoring – Maternity MoH GL2018/025
- Assisted Vaginal Birth – SESLHDGL/050
- Fetal Blood Sampling (FBS) – Intrapartum
- Neonatal Resuscitation at delivery
- Admission of a Neonate to Newborn Care Centre

3.6 References

1. Royal Australian College of Obstetricians and Gynaecologists Intrapartum Fetal Surveillance Clinical Guideline – Fourth Edition [Internet]
2. South Australian Perinatal Practice Guideline, Fetal Acid Base Assessment. SA Health, Government of South Australia, 2020
3. Canberra Health Services Clinical Guideline Cord Blood Collection for Blood Group, Direct Coomb's test (DCT) and Blood Gas Sampling, Canberra Health Services, 2016.
4. Wong C, Wilkinson R, Odendahl J, Wilson E. Delayed cord clamping: Impact on fetal cord blood gas analysis. Australian and New Zealand Journal of Obstetrics and Gynaecology. 2022, 62(2):328-331.
5. Ramin S. Umbilical cord blood acid-base analysis at delivery. In: Lockwood C, Ed. 2016 Oct 6. Available from: https://www.uptodate.com.

4. CULTURAL SUPPORT

- When clinical risks are identified for an Aboriginal woman, she may require additional supports. This may include Aboriginal health professionals such as Aboriginal liaison officers, health workers or other culturally specific services.
- For a Culturally and Linguistically Diverse CALD woman, notify the nominated cross-cultural health worker during Monday to Friday business hours
- If the woman is from a non-English speaking background, call the interpreter service: NSW Ministry of Health Policy Directive PD2017_044-Interpreters Standard Procedures for Working with Health Care Interpreters.

5. REVISION AND APPROVAL HISTORY

Date	Revision No.	Author and Approval
Endorsed by Safety and Quality Committee 16 June 2023 Reviewed and endorsed Maternity Services CBR 16/5/23 Reviewed and endorsed Maternity Services LOPs 11/4/17 Approved Clinical Performance & Quality Committee 21/5/07 Reviewed Maternity Services Clinical Committee 10/4/07 Approved Quality Council 18/4/05 Reviewed March 2007		