Recognition and Response to Acute Deterioration (RRAD) in the Newborn Policy

1. Policy Statement

The purpose of this policy is to:

- ensure newborns known to be at increased risk of clinical deterioration following birth are recognised and receive timely, appropriate clinical management to minimise their risks
- provide guidance on cord blood gas collection, analysis and interpretation to enable appropriate clinical management of newborns known to be at risk
- provide guidance on the optimal timing of cord clamping following birth.

2. Definitions

BE	base excess
ECC	external cardiac compressions
IPPV	intermittent positive pressure ventilation (bag and mask or neopuff)
IUGR	Intrauterine Growth Restriction
NETSWA	Neonatal Emergency Transport Service Western Australia
Non-vigorous newborn	requires ANY resuscitative measures at birth or with abnormal Apgar scores
Vigorous newborn	does not require any resuscitative measures at birth with normal apgar scores
PGL	Plasma glucose level
PPH	Post-Partum Haemorrhage
Precipitate birth	A rapid or uncontrolled birth that usually occurs with either · a combined 1st and 2nd stage of less than 2 hours, or · a 2nd stage of less than 10 minutes without time for the usual midwife birth preparations *WA Guidelines for Midwives. Notification of Case Attended.* Health Regulations 1994
Resuscitative measures	any requirement for intermittent positive pressure ventilation (even briefly) or external cardiac compressions
SGA	Small for Gestational Age
UA	Umbilical Artery
UV	Umbilical Vein
WHO	World Health Organisation

3. Optimal Timing of Cord Clamping

3.1 RANZCOG and NICE guidelines recommend optimal timing of cord clamping:

- **One (1) to three (3) minutes after all births,** while initiating simultaneous essential newborn care

Early cord clamping (< 1 minute after birth) is not recommended unless the neonate is asphyxiated and needs to be moved immediately for resuscitation.

3.2 Optimal cord clamping should not interfere with the timing of oxytocic administration for active management of the third stage (the use of uterotonics for the prevention of PPH during the third stage is recommended for all births as per the WHO).

- **intramuscular oxytocic injection**: maximum newborn cord transfusion benefit has occurred after 2.5 minutes.
- **intravenous oxytocin injection**: maximum newborn cord transfusion benefit has occurred after one minute.

3.3 Double clamping a segment of cord, with optimal timing should occur at ALL births, as this allows for subsequent cord blood gas sampling and analysis, should it become indicated.

3.4 For Rhesus negative women, cord blood group and Direct Antiglobulin sampling (Coomb's test) can be collected from the insitu cord after obtaining a double clamped cord segment.

4. Cord Blood Sampling Collection Procedure

Cord blood gas samples are to be taken where there is any identified risk of, or potential for, newborn compromise at or after birth – see Appendix 3 for those newborns known to be at risk.

4.1 Ensuring accurate collection

4.1.1 All staff must be observed to demonstrate competence in cord blood collection for blood gas and/or acidaemia analysis before undertaking the procedure without supervision.

4.1.2 Paired arterial and venous cord blood samples for gas analysis are recommended for all newborns known to be at clinical risk, as a minimum (sites may opt to undertake routine paired cord blood sampling to avoid missing at risk babies).

4.1.3 Where possible, paired arterial and venous umbilical cord blood samples are to be obtained. If only one sample is possible, is it preferable to obtain the arterial sample, as this is more representative of fetal metabolic condition. Venous samples represent maternal acid base balance and placental function.

4.1.4 Record the time the cord was clamped in the Birth History section of the Newborn Care Plan **(MR75)** as cord blood gas results are influenced by the timing of cord clamping. These differences are small and unlikely to be of clinical importance, but the time of clamping is required to facilitate correct interpretation of the cord blood gases and clinical assessment of the newborn.

4.2 Sample collection from an unclamped cord

Accurate cord blood samples can be collected from the unclamped, pulsating umbilical cord at birth. A combine is to be immediately available to shield attendants from possible blood spray, the accoucheurs must also be wearing appropriate Personal Protective Equipment (PPE).

4.3 Cord blood collection procedure

As per KEMH clinical guidelines: Section B O&G / Intrapartum care / Specimen collection post-birth Labour - Cord Blood Collection Analysis at Birth.

4.4 Normal cord blood gas ranges (at birth)

At Term	pH	Base Excess mmol/L	pO_2 mm Hg	pCO_2 mm Hg	Lactate mmol/L
UA	7.10 -7.38	-9.0 to 1.8	4.1 to -31.7	39.1 to 73.5	≤ 6.1
UV	7.20 -7.44	-7.7 to 1.9	30.4 to 57.2	14.1 to 43.3	≤ 6.1

In vigorous newborns, unless other clinical conditions become apparent within the first twenty four hours following birth, umbilical artery lactate acidaemia should not be regarded as having any major long term clinical significance.

5. Clinical Management of the Vigorous Newborn at Risk with Abnormal Cord Gases (See Appendix 1)

5.1 Vigorous neonates with abnormal cord gas values, who do not require any resuscitative measures at birth, still require **close observation over the first twenty four hours of life** as they are at risk of hypoglycaemia and hypothermia. Abnormal cord gas results must be advised to the admitting obstetric doctor or paediatrician if available.

5.2 Close observation after birth is defined as:

- Continuous O_2 saturation monitoring for the first 2hrs of life
- **15 minutely observations** for the first hour of life including heart rate, respirations (pattern and sounds), colour, tone and temperature once.
- **Hourly observations** as above **for the next three hours** (including temperature) **then**
  - observations with each feed for a minimum of 24 hours
  - early feed (within three hours of birth)
  - pre-second feed PGL repeated 6 hourly until two PGLs of **2.6** mmol/l or more.

5.3 Abnormal observations are to be reported to the admitting obstetric doctor or paediatrician if available with a documented management plan for ongoing care and observation frequency.

6. Clinical Management of the Non-Vigorous Newborn at Birth (See Appendix 1)

6.1 All non-vigorous infants at birth require:
- paired cord blood sampling
- admission to the nursery for ongoing assessment and care, and
- Consultation with and/or review by a paediatrician.

6.2 Urgent consult by a paediatrician, or discussion with the NETSWA neonatologist, will determine if there indications for neuro-protective therapy (head cooling) such as:
- apgar less than 7 at 5 mins **OR**
- require any IPPV / ECC **OR**
- acute perinatal event that may have caused a hypoxic ischaemic insult (antepartum haemorrhage, fetal heart rate abnormalities etc.) together with clinical signs of hypoxic-ischaemic encephalopathy (HIE) such as lethargy, hypotonia, weak primitive reflexes, seizures/ apnoeas etc.

Assessment is also to seek to deduce whether there are any features consistent with sepsis (chorioamnionitis, prolonged rupture of membranes, maternal fever, respiratory distress etc.).

6.3 There is a brief therapeutic window for neuroprotective interventions (up to six hours post birth) which requires assessment by, or discussion with, a paediatrician in the immediate post-natal period.

7. Special Circumstance – Managing the Risk of Subgaleal Hameorrhage (SGH) Following Operative Vaginal Birth

7.1 Background

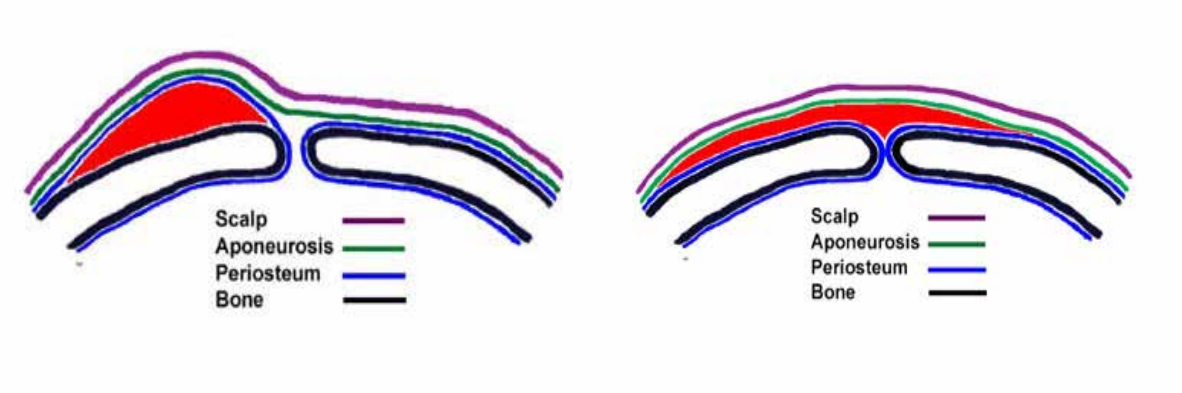
- The rate of vacuum birth has surpassed that of forceps over the past two decades.
- Scalp tissue injuries such as abrasions, chignon and cephalohaematoma are usually of limited significance however extracranial SGH can be a serious complication following instrumental delivery.
- The incidence of SGH is variably reported:
  - At 0.5/1000 during normal birth, forceps or caesarean
  - At 5/1000 for vacuum births
- SGH is caused by separation of the epicranial aponeurosis from the underlying periosteum creating a large compartment space of up to 250ml of blood with only a one centimetre increase in scalp thickness.
- Visual inspection alone, without palpation may miss a SGH because the blood loss moulds to the shape of the scalp leading to late detection.
- Newborns can lose 50 -75% of their blood volume into that sub aponeurotic space resulting in hypovolaemic shock, anaemia, coagulopathy and death.

- Neonatal mortality ranges from 12% to 25% amongst those admitted to NICU with SGH, and requires a high index of suspicion in the 'at risk' newborn.
- **The vast majority of SGH can be detected within hours of birth.**

7.2 Recognition of subgaleal haemorrhage

- The initial localised signs of a SGH are of vague, generalised scalp swelling with laxity of the scalp at the site of the vacuum cup application.
- The chignon (caput) in contrast, is firm in consistency and usually resolves within one hour.
- If SGH progresses, the lesion becomes fluctuant; the sensation on palpation is likened to 'an old leather pouch filled with fluid'.
- A ballotable lesion that crosses the suture lines should alert the carer to the possibility of a SGH, as should the presence of 'pitting oedema' extending over the head, and in front of the ears.
- The SGH is not contained by suture lines (see diagram one below) as opposed to cephalhaematomas which are contained within suture lines.
- The SGH fluid is gravity dependent and will shift to the dependent side as the infant is repositioned.
- An irritable cry or signs of pain may be noted with handling.
- Serial head measurements may be useful, although it should be noted that large blood loss can occur despite a relatively small increase in head circumference.
- In severe cases, ear lobes may be displaced or shifted downwards by mass effect and eyelids may appear puffy.

Diagram 1: Distinguishing between cephalohaematoma and SGH



CEPHALHAEMATOMA
Confined by periosteum to the midline

SUBGALEAL HAEMORRHAGE
Moulds to shape of scalp; crosses sutures

7.3 Other important considerations

- Ensure a second doctor (paediatric if available) is present for the newborn at all instrumental births.
- Additional newborn observations and surveillance for SGH are to be as per Appendix 2.

- Ensure that intramuscular Vitamin K is given immediately following vacuum assisted vaginal birth. If consent is declined, there must a documented record of the counselling provided to the parents about the additional risks of SGH.
- Carers must be **alert to the following high risk scenarios**:
  - Premature babies (< 37 weeks). Any instrumental delivery under gestational age of 37 weeks should only be undertaken under the direct supervision of the on-call consultant obstetrician. Where time critical, the clinical situation should be explicitly discussed by telephone (i.e. at a non-regional site with no time for transfer) and proceed under direct instruction.
  - Failed vacuum extraction, prior to forceps birth.
  - Extraction taking more than 3 contractions, more than 10 minutes or more than 2 cup detachments.
  - Placement of the vacuum cup over the sagittal suture near the anterior fontanelle.

8. Roles and Responsibilities

8.1 The primary intrapartum midwife is to identify and document the presence of any known newborn risks; notify these to the primary doctor and ensure preparation for cord blood analysis.

8.2 The primary midwife is to record on the Newborn Observation and Response Chart (NORC) **MR 140D**, observations for all newborns recognised to be at risk of clinical deterioration.

8.3 The primary midwife, or the primary doctor, is to collect the cord blood samples for newborns with recognised risks and process via the point of care testing requirements for that site.

8.4 The primary midwife is to immediately notify any abnormal gas analysis results or newborn observations to the managing obstetric doctor and/or the paediatrician for assessment and an ongoing documented clinical management plan.

8.5 The primary midwife is to record the cord blood results in the Birth History section of the Newborn Care Pathway (**MR75**), the Birth register and in the woman's Stork record.

8.6 The primary midwife is to ensure documentation of the timing of the cord clamping within the cord blood results section of the Newborn care pathway (**MR75**).

8.7 The midwife entering the birth and/or postnatal data into Stork should generate a Special Child Health Referral for all newborns who are identified at clinical risk at birth.

9. Compliance

Failure to comply with this policy document may constitute a breach of the WA Health Code of Conduct (Code). The Code is part of the Employment Policy Framework issued pursuant to section 26 of the Health Services Act 2016 (WA) [HSA]and is binding on all WA Country Health Service (WACHS) staff which for this purpose includes trainees, students, volunteers, researchers, contractors for service (including all visiting health professionals and agency staff) and persons delivering training or education within WACHS.

WACHS staff are reminded that compliance with all policies is mandatory.

10. Evaluation

Abnormal cord blood results are reported via the monthly Stork auto report received by maternity managers. The records of these infants are to undergo clinical review (by the Nurse Unit Manager / Clinical Nurse Manager or delegate) to ensure the care was appropriate, with any identified care deficits reported as a clinical incident.

11. Standards

National Safety and Quality Healthcare Standards (First edition 2012) - 1.8.1, 1.8.3, 9.1.2

National Safety and Quality Healthcare Standards (Second edition 2017) - 1.15a-c, 1.16a, 1.27a, 5.4a-c, 5.5a, 5.6, 5.7a+b, 5.13a+f, 6.9a+b, 6.11a-c, 8.4, 8.6

12. References

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Udechuku A, Nguyen T, Hill R, Szego K. Antidepressants in pregnancy: A systematic review. Aust N Zealand J Psychiatry 2010;44(11):978-96.

WHO Guideline: Delayed umbilical cord clamping for improved maternal and infant health and nutrition outcomes. Geneva, World Health Organization; 2014

WHO Guidelines on basic newborn resuscitation. Geneva, World Health Organization; 2012

WHO Recommendations for the prevention and treatment of postpartum haemorrhage; 2012

13. Related Forms

MR140D WACHS Newborn Observation and response Chart (NORC)
MR75 WACHS Newborn Care Plan

14. Related Policy Documents

KEMH:
Cord Blood Collection / Analysis at Birth
Neonate: Immediate Care for Babies born in Labour and Birth Suite
Subgaleal haemorrhage (SGH) Detection and Management in the Newborn
Labour: Third Stage

15. Policy Framework

Clinical Governance, Safety and Quality Policy Framework

This document can be made available in alternative formats on request for a person with a disability

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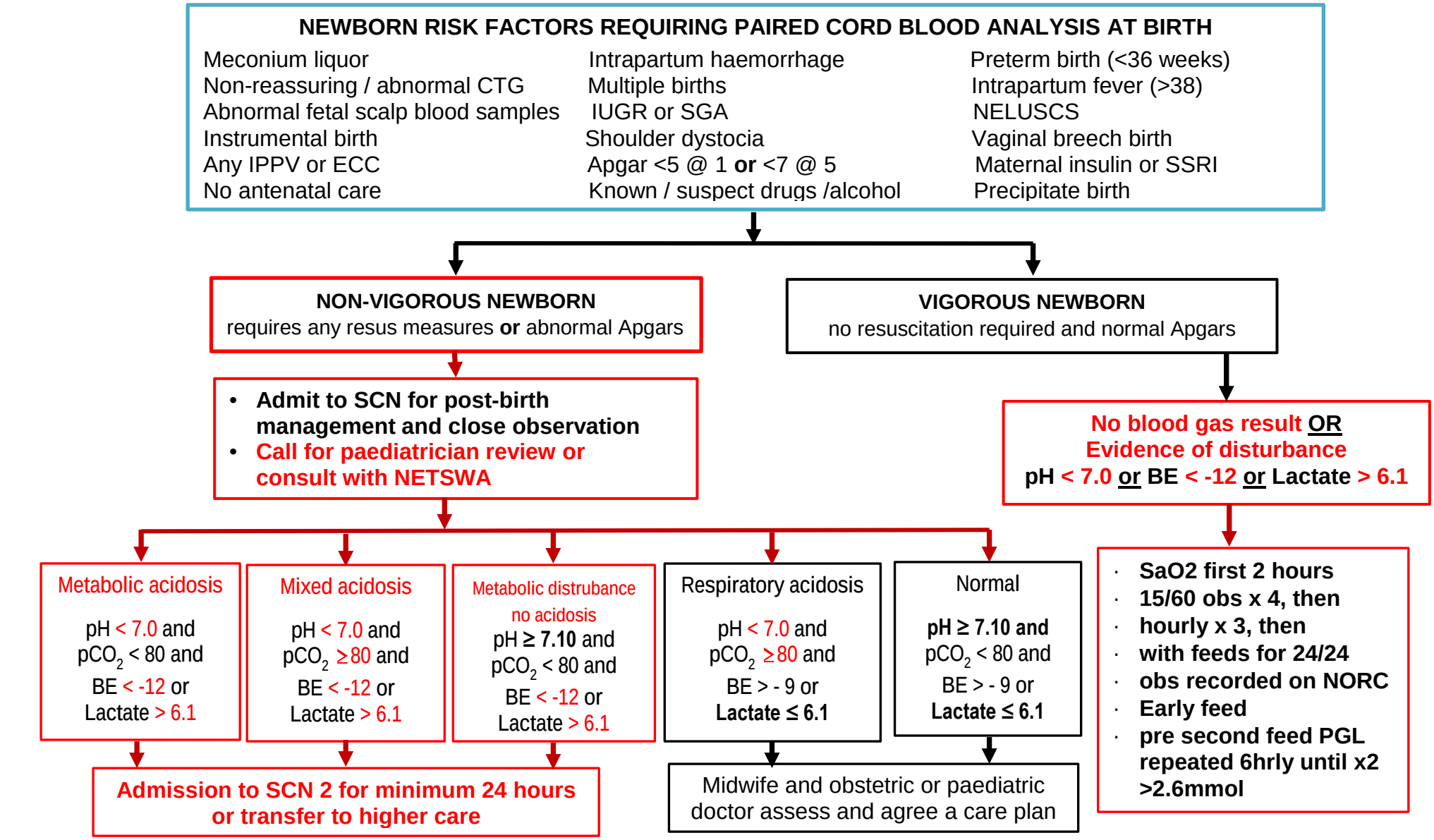
Appendix 1: Recognition and Response to Acute Deterioration in the Newborn Flow Chart



Appendix 2: Newborn surveillance for SGH following instrumental birth

Level of Surveillance	Indication	Minimum surveillance
1	**All instrumental Deliveries**	· Recommend IMI Vitamin K · No hat/bonnet · Set of baseline post-delivery observations 15 minutely for 1 hour (x 4): o Activity, Colour, HR, RR, SaO_2 and capillary refill o Visual inspection of vacuum attachment site, shape of head, swelling, bruising, forcep marks and palsies at 1, 2, 4 and 8 hours o Palpation for boggy, fluid swelling and fractures at 1, 2, 4 and 8 hours · Institute Level 2 surveillance if any of the following: poor feeding, poor activity or pallor:
2	**Instrumental delivery with any of the following:** · >10 minute extraction time **or** > 2 pulls **or** > 2 cup detachments · Unsuccessful vacuum extraction · Vacuum placement over the sagittal suture and near the anterior fontanelle · 5 min Apgar < 7 · Clinician Request · Level 1 observation concerns (e.g. boggy swelling)	· Alert the paediatric doctors if they are not already aware · Ensure cord blood acid-base status obtained (pH or lactate) · Haematocrit and platelet count (i.e. FBC) · Observations for 12 hours after birth including activity, colour, HR, RR, SaO_2 o 15 minutely for first hour o Hourly for next 2 hours o 2nd hourly for a further 6 hours o Paediatrician to advise as to frequency of BP monitoring after baby review · Visual inspection and palpation of the scalp at 1, 2, 4 and 8 hours.
3	**Instrumental delivery where:** · There is clinical suspicion of SGH · Abnormalities are noted on level 2 surveillance	· The infant should be admitted to the SCN and reviewed by a paediatrician · At a minimum there should be 15 minutely HR, RR, BP and continuous pulse oximetry until paediatrician consult /review · Visual inspection and palpation of the scalp at 1, 2, 4 and 8 hours including measurement of head circumference. · Further laboratory assessment including FBC, coagulation studies and cross-match · Ensure availability of cross matched blood and Fresh Frozen Plasma · The paediatrician will discuss the patient with the NETSWA team.

Appendix 3: Newborns requiring cord blood sampling at birth *(not exhaustive)*

1. Any baby requiring active resuscitation (IPPV or ECC)
2. Abnormal Apgars (< 5 at 1 minute **or** < 7 at 5 minutes)
3. Non-reassuring **or** abnormal CTG
4. Abnormal intrapartum fetal scalp blood samples
5. Meconium liquor
6. NELUSCS
7. Instrumental birth
8. Precipitate birth*****
9. Shoulder dystocia (actual)
10. IUGR or SGA
11. Preterm birth (<36 weeks)
12. Maternal fever intrapartum (>38 degrees)
13. Multiple births
14. Vaginal breech birth
15. Maternal insulin
16. Maternal SSRIs*****
17. No antenatal care
18. Known or suspected maternal illicit drug or alcohol misuse
19. Intrapartum haemorrhage
20. Other clinical concerns

*** New indications 2018**

Late pregnancy exposure to SSRIs increases the newborn risk of:

- SSRI neonatal behavioural syndrome (10-30%) - respiratory, motor, central nervous system and gastrointestinal symptoms (**usually** mild and transient)
- Persistent pulmonary hypertension (rare)