Arterial cord pH of <7.1 – retrospective case cohort review for learning and improvement at Royal United Hospitals Bath (RUH)

Laura Price – Patient Safety Midwife
Jodie Clement – Quality and Safety Lead for Maternity and Neonatal Services

Royal United Hospitals Bath
NHS Foundation Trust

Introduction

Umbilical cord blood gas analysis is one of the most objective measures of a newborns metabolic condition at birth and can give an indication of any preceding fetal hypoxic stress (Sundberg *et al*, 2023).

A Datix incident report is required if arterial cord blood gas is <7.1.

In April – November 2023 compared to same time period in 2022 there were double the number of incidents of arterial cord blood gas <7.1 (figure 1)

An in-depth review was conducted of 16 local cases of cord pH <7.1 between April to November 2023, a 25% sample size spread evenly across the time period (2 cases per month). Sample selection was random. During the review period there were 2828 births in RUH maternity services, of which 62 babies were born with a cord pH <7.1. This identifies a cord pH <7.1 rate of 2.2%.

There is currently no national benchmarking available, to understand if this is an outlying position or a nationally replicated increase.

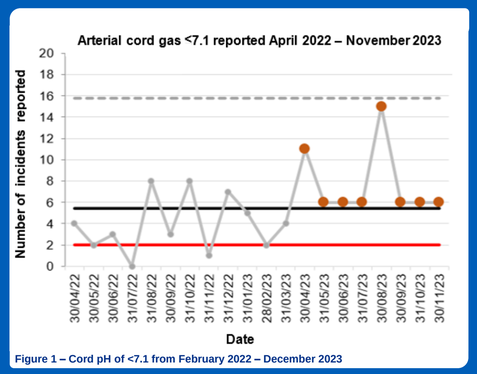


Figure 1 – Cord pH of <7.1 from February 2022 – December 2023

Why is this happening?

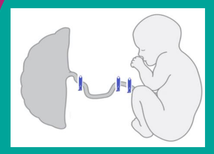
Are there any MODIFIABLE factors to reduce incidence of low cord pH?

A wide range of factors were reviewed - intrapartum care, parity, spontaneous vs iatrogenic labour onset, length of labour, mode of birth, birth weight, birth location, staffing levels, fetal monitoring, neonatal outcomes and admission to neonatal unit

FINDING: The average time from birth to testing the cord gas was 20min

Informal focus groups with Midwives showed…
Aware cord gas samples should be taken promptly but uncertain as to longest time period that samples are still valid. Different practices regarding cord clamping, some routinely double clamp at ALL births, some only if cord gases required and some not at all.

LEARNING: The accuracy of cord gas samples deteriorate over time especially if the cord blood remains in continuity with the placenta (Armstrong and Stenson, 2006; Duerbeck *et al*, 1992)



PRACTICE IMPROVEMENT: Care giver to double clamp the cord for ALL births (in case cord blood gas analysis is required)
Ensure the neonatal team have a cord gas result by 30min in order to provide correct and optimal treatment. Cord gas to be taken ASAP after birth
Ensure Electronic fetal monitoring and care in labour guideline in line with NICE intrapartum care guidance

Duration from birth to cord gas sample collection and analysis*	Interpretation
≤10min	Optimal time
≥20min	Acceptable time but interpret with caution
≥30min	Interpret with knowledge of sample delay
≥60min	Not valid, discard sample

*all taken from double clamped cord

For samples analysed in excess of 30 minutes and neonatal pathway of care not absolute to discuss with neonatal consultant

LEARNING: To increase awareness that if a mother is in labour and awaiting an EMCS (due to a planned ELCS), when a CTG is used fresh eye assessments should still be completed. This case to be featured in the 'Safety Catch' in order to disseminate learning

FINDING: of the cases reviewed 25% (n=4) used oxytocin and 12.5% (n=2) of these had tachysytole

LEARNING:
Definitions of hyperstimulation and tachysytole and association with oxytocin use to be taught on Saving Babies Lives study day, esp regarding impact this can have on babies born with arterial cord pH <7.1

PRACTICE IMPROVEMENT: Continue to consider reducing oxytocin when tachysystole (and hyperstimulation) is noted

FINDING: EMCS and instrumental births have higher incidence of low cord gases (as birth often expedited due to fetal distress)

LEARNING:
Continue to be vigilant to the importance of taking cord gases for births with fetal distress

FINDING: Clarification needed on when paired cord gas sample should be taken

LEARNING: table to be incorporated into guidance

Paired cord samples should be obtained if	
Instrumental birth	Shoulder dystocia*
Emergency caesarean birth	Intrapartum fever <38°C
Vaginal breech birth	Multiple pregnancies
Apgar score <7 at 1 minute	Pathological CTG within 1hr of birth
Elective caesarean section	Birth weight <3rd centile
Preterm babies*	Meconium
If neonatal team attend birth	Diabetic mothers on sliding scale

*whilst maintaining awareness of the particular benefits of delayed cord clamping to preterm infant and those who have shoulder dystocia

LEARNING: Recommendation for an exploration of shared learning regarding arterial cord pH <7.1 within the LMNS to improve benchmarking, accountability and learning

References
Sundberg, T. M., Wiberg, N., & Källén, K. (2023). Adverse neonatal outcome and veno-arterial differences in umbilical cord blood pH (ΔpH) at birth: a population-based study of 108, 629 newborns. *BMC Pregnancy Childbirth*, 162.
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Contact
Laura Price – Patient Safety Midwife – RUH Bath
laura.price18@nhs.net