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Clinical Guideline for the Use of Intrapartum Fetal Monitoring and Fetal Blood Sampling

For Use in:	All Maternity Areas
By:	Medical and Midwifery Staff
For:	Antenatal and Intrapartum Patients
Division responsible for document:	Women and Children's Services
Key words:	Fetal Monitoring, Cardiotocograph, Intrapartum, fetal blood sampling
Name and job title of document author:	Mr Charles Bircher, Consultant Obstetrician
Name and job title of document author's Line Manager:	Martin Cameron, Clinical Director
Supported by:	Daisy Nirmal, Practice Development Midwife Rosie Goodsell, Practice Development Midwife
Assessed and approved by the:	Maternity Guidelines Committee If approved by committee or Governance Lead Chair's Action; tick here ☑
Date of approval:	23/07/2019
Ratified by or reported as approved to (if applicable)**:**	Clinical Safety and Effectiveness Sub-board
To be reviewed before: This document remains current after this date but will be under review	22/01/2021
To be reviewed by:	Miss Daisy Nirmal
Reference and / or Trust Docs ID No:	840
Version No:	7.7
Description of changes:	Amended to bring into line with induction of labour and meconium guidelines
Compliance links: *(is there any NICE related to guidance)*	National Institute for Health and Care Excellence. Clinical Guideline "Intrapartum care for healthy women and babies during childbirth. CG190 December 2014
If Yes - does the strategy/policy deviate from the recommendations of NICE? If so why?	Firstly we deviate significantly from the NICE 2014 guideline. In the rationale section we explain why we (and a significant number of other units in London and worldwide) do so. NICE are already planning on changing their guidelines. We follow FIGO guidelines.

This guideline has been approved by the Trust's Clinical Guidelines Assessment Panel as an aid to the diagnosis and management of relevant patients and clinical circumstances. Not every patient or situation fits neatly into a standard guideline scenario and the guideline must be interpreted and applied in practice in the light of prevailing clinical circumstances, the diagnostic and treatment options available and the professional judgement, knowledge and expertise of relevant clinicians. It is advised that the rationale for any departure from relevant guidance should be documented in the patient's case notes.

The Trust's guidelines are made publicly available as part of the collective endeavour to continuously improve the quality of healthcare through sharing medical experience and knowledge. The Trust accepts no responsibility for any misunderstanding or misapplication of this document

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Glossary of terms used

Bpm:	Beats per minute	CS:	Caesarean section
CTG:	Cardiotocograph	EFM:	Electronic fetal monitoring
FBS:	Fetal blood sample	FHR:	Fetal heart rate
IA:	Intermittent auscultation		

Objective

The objective of this guideline is to improve the standard of fetal surveillance, especially intrapartum. It provides the criteria for identifying normal, suspicious and pathological heart beat traces, and recommends appropriate responses to these – in an effort to reduce perinatal mortality and morbidity.

Rationale

The monitoring of the fetal heart in labour aims to identify hypoxia before it is sufficient to lead to damaging acidosis and long-term irreversible neurological damage in the baby.

Continuous electronic fetal heart rate (FHR) monitoring was introduced into obstetric practice in the 1970s and within a few years the majority of units were employing the technique[1]. However, intrapartum electronic fetal monitoring (EFM) was introduced into clinical practice before its effectiveness had been prospectively evaluated.

The Dublin trial of EFM versus intermittent auscultation (IA) for low risk women reported its findings in 1985[2]. This large prospective study found very little difference in perinatal outcome between the two groups, and although the rate of neonatal seizures was higher in the IA group, there was no significant difference in the rates of cerebral palsy when these infants were assessed subsequently[3].

What was unquestionably true was that the introduction of EFM led to an immediate increase in the rate of obstetric intervention, with a three-fold increase in the caesarean section rate in units that did not employ fetal blood sampling (FBS) in conjunction with EFM.

There has been debate regarding the value of the “admission test”, a short duration of continuous CTG performed on all women admitted to the delivery floor – even low risk patients. It was initially thought that this could act as a screening test to detect hitherto unsuspected fetal compromise at the onset of labour[4]. However, there is now a consensus that admission CTGs are poor at predicting fetal compromise during labour. Furthermore, successive CESDI reports have noted a recurring problem in the use and interpretation of CTGs[5].

Such findings forced a critical re-appraisal of the role of EFM in low risk women[6], culminating in the release of national, evidence-based guidelines by the RCOG in May 2001[7] and subsequently endorsed by NICE. Minor amendments to the classification of trace features was made by NICE and published in their guideline on “Intrapartum care”[8] in 2007.

Since the publication of these guidelines, there has been further debate regarding the classification and interpretation of CTGs, culminating in the release of separate guidelines by NICE[9] and the International Federation of Gynaecology and Obstetrics (FIGO)[10].

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At the meeting of the London labour ward leads on 13th November 2015, attended by 30 obstetricians representing 15 maternity units in London, the revised FIGO guideline on Intrapartum Fetal Monitoring was reviewed and discussed. It was noted that the FIGO Guideline Development Group had RCOG representation and consisted of 50 CTG experts from 37 countries, and that these guidelines are likely to be implemented by over 50 member societies of FIGO. They will form the basis for standardised interpretation to support future research and international comparison of perinatal outcomes.

After careful consideration the London Labour Ward Leads Group reached consensus (>90%) that they would now advocate FIGO guidance over NICE CTG guidelines and support its implementation into routine clinical practice in the UK. NNUH has decided to follow this lead and use the interpretation laid out by FIGO, accepting these differ from the most recent NICE guideline.

Broad recommendations

Current national guidelines regarding the admission CTG and monitoring of low-risk women in labour require staffing levels that are often impossible to achieve in practice. For this reason, some adaptations to national recommendations have been made to take account of local practice.

A. The admission CTG

If a low-risk woman is admitted in early labour and 1:1 midwifery care in labour can be delivered, then the admission CTG may be omitted at the discretion of the midwife.

B. Low-risk patients refer to midwifery guidelines 7v4 intrapartum care in all settings

For a woman who is healthy and has an otherwise uncomplicated pregnancy of up to 40^{+14} weeks, intermittent auscultation should be offered and recommended in labour to monitor fetal wellbeing, wherever practical.

Intermittent auscultation can be performed by using Pinard's stethoscope or hand held Doppler. Maternal pulse should be palpated simultaneously to differentiate from fetal heart rate. This should be recorded hourly.

In the active stages of labour intermittent auscultation should occur:

- For at least one minute recorded as a single rate in the records
- Immediately after a contraction
- At least every 15 minutes in the first stage
- At least every 5 minutes in the second stage

The fetal heart rate may be recorded on the partogram every 15 minutes to see a trend but must be taken and recorded within the text of the hand held records every 5 minutes in the second stage of labour. If it is not possible to listen as frequently the reason must be clearly documented.

In addition, continuous EFM should be offered and recommended in pregnancies previously monitored with intermittent auscultation:

- If there is any evidence of a fetal heart rate $\leq$ 110 bpm or $\geq$ 160 bpm
- If there are any decelerations

- If any intrapartum risk factors develop (see below)

Low risk women with regional analgesia – electronic fetal monitoring should be initiated for at least 30 minutes during establishment of regional analgesia and following any top up.

C. High-risk patients

A large number of patients fall into the "high risk" category, either as a result of maternal or fetal risk factors identified antenatally, or as a result of intrapartum problems (see below) – all such women should be offered and recommended continuous EFM. Prior to connecting the machine, ensure that the automatic date and time settings are correct and that the rate is set at 1cm per minute. A systematic assessment of the intrapartum CTG trace should be made at least half-hourly and classified according to the FIGO criteria (see below).

Women should be informed that continuous fetal monitoring will restrict their mobility in labour.

Maternal problems	Fetal problems	Intrapartum
Previous CS	Growth restriction	Oxytocin augmentation
Pre-eclampsia	Oligohydramnios	Bleeding in labour
Raised BP >140/90	Prematurity	Maternal pyrexia
Prolonged ROM >24 hrs	Abnormal Dopplers	Regional anaesthesia
Post term pregnancy (>42 weeks)	Significant Meconium liquor	
Multiple Pregnancy	Breech	
Induction of labour (unless ARM only)		
Diabetes		
Ante partum haemorrhage		
Other maternal medical disease		
Maternal obesity:		

- NICE recommends continuous monitoring if booking BMI ≥35.
- However RCOG recommends if BMI 30-39.99 with good mobility, especially if multiparous, women can deliver on MLBU. Therefore if continuous monitoring is declined, women with a BMI <40 can go to MLBU with intermittent auscultation.

Documentation

Once a CTG has commenced the following information should be included on the trace:

- Patient's name and hospital number.
- Date and time (use 24 hour clock) trace commenced check this is correct on the CTG.
- The rate should be set at 1cm per minute.
- Maternal pulse at the time the trace commenced and hourly throughout labour also to be recorded on the sticker.
- Any key intrapartum events – such as a vaginal examination, membrane rupture, siting and topping-up an epidural – should be noted at the time of the event and the time noted and signed.
- Any member of staff who is asked to provide an opinion on a trace should note their findings on both the trace and the medical records, along with date, time and

signature.

- Following birth, the healthcare professional should sign and note the date, time and mode of delivery on the FHR trace.
- CTGs performed antenatally should be countersigned by 2 midwives upon completion. The modified antenatal CTG sticker should be used to aid interpretation and once completed placed in the maternity hand held records.

Half-Hourly Systematic review of CTG

The interpretation of the FHR trace should take into consideration any risk factors, the stage of labour, progress in labour, maternal and fetal condition, as well as the features of the FHR trace. The CTG should be classified at least half-hourly as normal, suspicious or pathological using the following criteria.

"Fresh eyes" review and categorisation of CTG by an independent person is recommended hourly. **Any risk factors should be documented.**

Explanation of Basic CTG Features

Baseline

This is the average rate of the FHR over a 10 minute period, assessed during a period of normal variability. It can vary between 10 minute periods.

- Normal baseline is 110-160, Preterm fetuses tend to have values toward the upper end of this range and post-term fetuses towards the lower end. Baseline tachycardia is usually associated with maternal pyrexia, which in turn may be associated with epidural. However a baseline tachycardia may also be associated with the initial stages of sub-acute fetal hypoxia.
- Baseline bradycardia of 100-110 can be a normal finding in an otherwise normal trace, especially in a post dates pregnancy.
- An increase in baseline, when combined with reduced variability or decelerations, can be a sign of fetal hypoxia.
- When reviewing a baseline, consider is the baseline appropriate for gestation?

Variability

Refers to the oscillations of the FHR around the baseline over one minute,
Normal variability is 5-25 bpm.

- Reduced variability is <5bpm for at least 50 minutes OR for 3 minutes during a deceleration. In labour it can be associated with fetal hypoxia, but also antepartum insults to the fetus. During sleep phases variability is rarely less than 5bpm. With a prior normal CTG, reduced variability is unlikely to be associated with hypoxia without decelerations or a rising baseline
- Increased variability is >25bpm for longer than 30 minutes. Its pathophysiology is poorly understood, but when associated with decelerations can be a sign of acute fetal hypoxia

Accelerations

Increase in the FHR by at least 15bpm above the baseline lasting more than 15 seconds, but less than 10 minutes. Accelerations are a sign of fetal well being.

- The absence of accelerations **in labour** is of unknown significance and therefore not included in the intra partum classification of CTG. However, their absence when not in labour would be suspicious.
- Before 32 weeks the amplitude and frequency of accelerations may be lower.
- Simultaneous monitoring of maternal and fetal heart rate can be useful in cases where it is difficult to distinguish between them. This should be considered, especially during the second stage of labour, when tracings show accelerations coinciding with contractions and maternal expulsive efforts.

Decelerations

Decrease in the FHR by more than 15bpm for more than 15 seconds. Previously NICE has classified variable decelerations as typical or atypical. This has lead to a lack of consistency and a large amount of interpersonal variation when classifying decelerations. Therefore FIGO, as well as NICE in their most recent guideline, have moved away from typical or atypical. These terms should no longer be used. Decelerations are of significance if they are repetitive, being with >50% of contractions

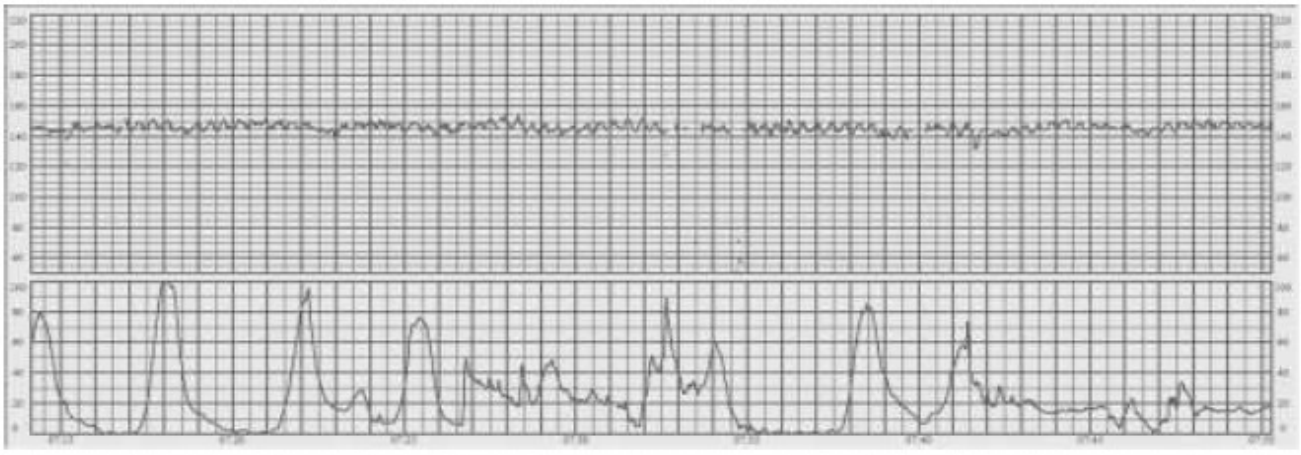
- **Early decelerations:**

  Shallow, short lasting with normal variability during the decelerations that coincide with contractions. **Do not indicate fetal hypoxia.**
- **Late decelerations:** “U” shaped and/or with reduced variability during the deceleration. Start more than 20 seconds after the onset of a contraction, with return to baseline after the end of the contraction. More than 30 seconds between the beginning or end of the deceleration and the nadir of the deceleration. If there are no accelerations and reduced variability, late decelerations can only drop by 10-15bpm to be of significance. **A sign of fetal hypoxia.**
- **Variable decelerations:** “V” shaped with good variability during the deceleration, lasting less than 3 minutes. Vary in size, shape and timing with contractions. These are the majority of decelerations in labour and **are seldom associated with fetal hypoxia.**
- **Prolonged decelerations:** Lasting >3 minutes. **A sign of fetal hypoxia.** If lasting >5 minutes at <80bpm with reduced variability within the deceleration they require immediate intervention.

Sinusoidal Pattern

A regular, smooth, undulating pattern, resembling a sine wave, with an amplitude of 5-15bpm, with a frequency of 3-5 cycles per minute. If lasting >30 minutes it can be associated with fetal hypoxia, fetal anaemia or infection..

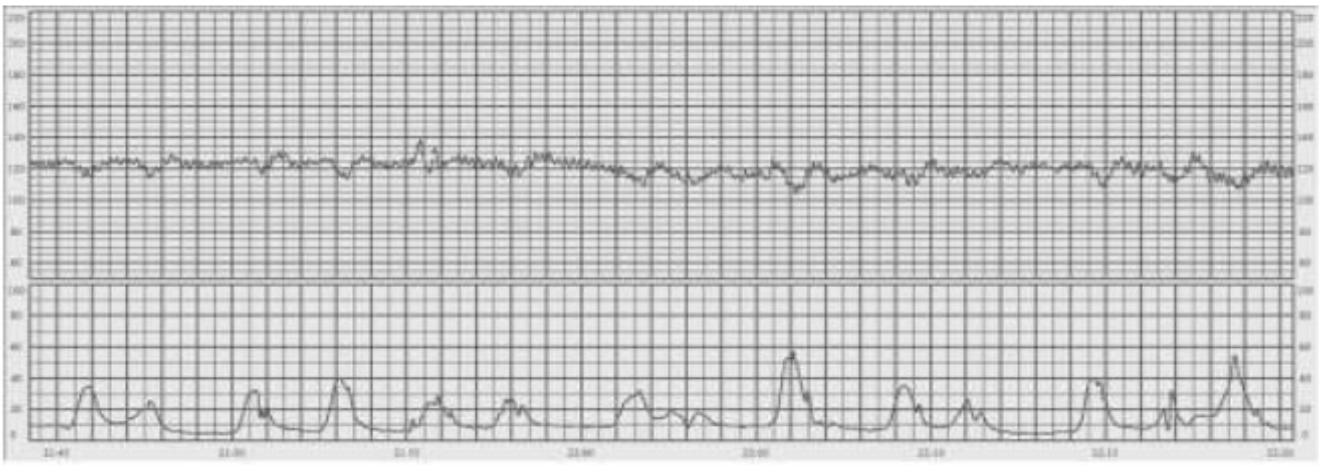
Sinusoidal Pattern



Sinusoidal trace

Pseudo-sinusoidal Pattern

Similar to sinusoidal pattern, but more “saw toothed” appearance, rather than the smooth sine wave. Rarely lasts more than 30 minutes.



Pseudo-sinusoidal trace

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CTG CLASSIFICATION – NORMAL, SUSPICIOUS OR PATHOLOGICAL?

<table>
<tr><td colspan="2">CTG Labour</td><td colspan="2">Date (ddmmyyyy):</td><td colspan="2">Risk Factors</td></tr>
<tr><td></td><td>Normal</td><td>Suspicious</td><td>Pathological</td><td>Plan</td></tr>
<tr><td>Baseline Rate (bpm)</td><td>110-160 bpm</td><td rowspan="3">Lacking at least one characteristic of normality, but with no pathological features</td><td><100 bpm</td><td rowspan="5"></td></tr>
<tr><td>Variability (bpm)</td><td>5 – 25 bpm</td><td>Reduced Variability for > 50 Min, Increased variability for >30 min, or sinusoidal pattern for >30 min</td></tr>
<tr><td>Decelerations</td><td>No repetitive decelerations</td><td>Repetitive late decelerations >30 min or 20 min if reduced variability, or one prolonged deceleration >5 min.</td></tr>
<tr><td>Interpretation</td><td>Fetus with no hypoxia/acidosis</td><td>Fetus with a low probability of having hypoxia/acidosis.</td><td>Fetus with a high probability of having hypoxia/acidosis.</td></tr>
<tr><td>Clinical Management</td><td>No intervention necessary to improve fetal oxygenation state</td><td>Action to correct reversible causes if identified, close monitoring or additional methods to evaluate fetal oxygenation</td><td>Immediate action to correct reversible causes, additional methods to evaluate fetal oxygenation, or if this is not possible expedite delivery. In acute situations (cord prolapse, uterine rupture, or placental abruption) immediate delivery should be accomplished.</td></tr>
<tr><td colspan="6">The presence of accelerations denotes a fetus that does not have hypoxia/acidosis, but their absence during labour is of uncertain significance. Decelerations are repetitive in nature when they are associated with more than 50% of uterine contractions.</td></tr>
<tr><td colspan="3">Fetal Movements last felt</td><td colspan="2">Date (ddmmyyyy):</td><td>Time (24 hr):</td></tr>
<tr><td colspan="2">Conts: :10</td><td>Mat. Pulse:</td><td colspan="2">Liquor Colour</td><td>Cervix: cms at Time (24hr):</td></tr>
<tr><td>Time (24 hr):</td><td colspan="3">Signature:</td><td colspan="2">Print Name and designation:</td></tr>
<tr><td>Time (24 hr)::</td><td colspan="2">Fresh Eyes Signature:</td><td colspan="2">Agree / Disagree please circle</td><td>Print Name and designation:</td></tr>
</table>

NORMAL A FHR trace in which **all three** features are classified as normal

SUSPICIOUS Lacking **at least one** characteristic of normality, but with no pathological features

PATHOLOGICAL **One or more** feature classified as pathological

AS A GENERAL RULE: If the fetus continues to maintain a stable baseline and reassuring variability, the risk of hypoxia to the central organs is very unlikely.

Appendix 1 and 2 give some brief points to consider when looking at a CTG, and specifically looking at decelerations as a quick reference guide.

Cycling pattern of FHR:

Cycling pattern is periods of reduced FHR variability, which alternate with periods of increased variability with or without accelerations. This is a key behavioural state of the normal term or near-term fetus which suggests neurological integrity and the absence of significant acidaemia or acidosis.

Actions to be taken in the event the CTG is assessed as suspicious or pathological:

Categorisation of a trace as suspicious or pathological does not necessarily mean delivery. However action is needed to improve the intra uterine environment. Correction of a reversible cause for the suspected hypoxia can result in a normalisation of the FHR. If a CTG is classified as suspicious, attempts should be made to prevent it from deteriorating and becoming pathological. Reversible causes include:

- **Excessive uterine activity**. This is the most common cause for fetal hypoxia. Can be corrected by stopping oxytocin infusion, removing prostaglandins or administration of a Tocolytic, such as 2 puffs of GTN sublingually or terbutaline (250mcg s/c)
- **Aorto-caval compression.** Can be a result of the mother being in the supine position, so can be corrected by changing maternal position, usually to her left lateral.
- **Sudden maternal hypotension.** Usually a result of regional anaesthesia, and can be corrected by rapid infusion of i.v. fluids.
- **Additional affect of maternal pushing.** In the second stage of labour, this can cause extra stress on the fetus, causing hypoxia to develop quicker. Therefore it may be appropriate to discontinue active pushing to allow the fetus to recover if delivery is not imminent or easily achievable.

These are broad recommendations – if in doubt SEEK ADVICE FROM A SENIOR

Maternity service's expectations for staff training in EFM

Please refer to the maternity staff training needs analysis (TNA)

Fetal blood sampling (FBS)

When it is used alone, electronic fetal monitoring (EFM) is associated with an increased likelihood of obstetric intervention, including instrumental vaginal delivery and caesarean section (CS).

FBS to establish acid-base status in cases where there are concerns about the fetal heart should increase the detection rate of true fetal compromise both during and after delivery and reduce unnecessary CS sections for suspected "fetal compromise". It must not lead to delay in urgently needed deliveries.

However there has been no high quality RCT to show the impact CTG with or without FBS has on fetal outcomes and intervention rates.

FBS should be performed in the left lateral position. The FBS results and any actions taken should be written in the labour record and the blood gas analyser print-out should **also** be secured in the labour record.

FBS should be undertaken:-

- In the presence of a pathological FHR trace, unless there is clear evidence of acute compromise or vaginal delivery can be expedited safely.
- When assisted birth is being considered because of an abnormal FHR pattern, FBS should be undertaken in the absence of technical difficulties or any contraindications (see below).

FBS should NOT be undertaken:-

- Where there is clear evidence of acute fetal compromise (e.g. prolonged deceleration greater than three minutes), FBS should not be undertaken and urgent preparations to expedite birth should be made.

Table 3: Classification of FBS results[8]

Lactate	pH	Interpretation	Action
≤ 4.1	≥ 7.25	Normal.	Repeat sample no more than 60 minutes later if this is still indicated by the CTG trace, or sooner if there are further abnormalities (eg. meconium appears)
4.2 – 4.8	7.21-7.24	Borderline.	Repeat sample no more than 30 minutes later if this is still indicated by the CTG trace, or sooner if there are further abnormalities (eg. meconium appears)
≥ 4.9	≤ 7.20	Abnormal.	Consultant obstetric advice should be sought. Delivery within 30 minutes is indicated

All scalp pH estimations should be interpreted taking into account the previous pH measurement, the rate of progress in labour and the clinical features of the mother and baby.

If the fetal heart rate (FHR) trace remains unchanged and the FBS result is stable after the second test, a third sample may be deferred unless additional abnormalities develop on the trace.

Where a third FBS is considered necessary, a consultant obstetric opinion should be sought.

If it is technically impossible to obtain a satisfactory sample, but there is an accelerative trace associated with scalp stimulation, then the likelihood of significant fetal acidosis is low.

The time taken to take an FBS needs to be considered when planning repeat samples.

Clinicians should take into account the time that it will take to achieve birth by both instrumental vaginal birth and caesarean section when making decisions regarding concern over fetal wellbeing during labour.

Contraindications to fetal blood sampling include:

1. Maternal infection (e.g. HIV, hepatitis viruses and herpes simplex virus)
2. Fetal bleeding disorders (e.g. haemophilia)
3. Prematurity (less than 34 weeks)

Cord blood gas analysis

Paired umbilical cord arterial and venous samples do not need to be taken routinely. However, they should be taken in the following situations:

1. All assisted deliveries for abnormal CTG/FBS
2. Cases of abnormal intrapartum CTG
3. Following labours in which an FBS has been performed
4. In all case of unexpectedly “flat” babies

Ensure that the cord gas results are written in the labour record and that the blood gas analyser print-out is **also** secured in the labour record.
NB. A **clinical incident form** should be completed for any babies with an arterial pH of **≤ 7.10** at birth, and the **paediatricians** should also be informed.

Summary of development and consultation process undertaken before registration and dissemination

The author listed above on behalf of the Obstetrics and Gynaecology Directorate Clinical Guidelines Committee, which has discussed and approved the guideline.

Distribution list/ dissemination method

This guideline will be available on the Trust Intranet.

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Appendix 1

Points to consider whilst reviewing CTG:

- Identify risk factors.
- Does the FHR pattern show cycling?
- Is the baseline appropriate for gestation?
- What is the baseline variability?
- Are accelerations present?
- Are there decelerations?
    - Are they early, late or variable?
    - What is the variability within the deceleration?
    - Are they “V” or “U” shaped?
- After the deceleration is the baseline rate and variability preserved?
- Categorise the CTG.
- If suspicious or pathological can the intra uterine environment be improved?
    - Excessive uterine activity?
    - Aorto-caval compression?
    - Maternal hypotension?
    - Maternal pushing?

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Flow Chart When Looking At Decelerations **Appendix 2**