

Fetal Monitoring for labour & birth (Electronic fetal monitoring & Intermittent Auscultation)

VERSION 12.1

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Care Group : Women and Children's

First implemented : 2005

This version implemented : 15th August 2025

Planned Review : May 2028

Keywords : Electronic fetal monitoring, Cardiotocograph, CTG,
Fetal Monitoring, EFM, IA

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Comments : References to SaTH Guidelines in the text pertain to
the latest version of the Guideline on the intranet.
Printed copies may not be the most up to date
version.

| Version | Implementation Date | History | Ratified By | Review Date |
|---------|---|---|-----------------------------|---------------|
| 1 | 2005 | LWP | LWF | 2008 |
| 2 | June 2010 | New guideline in this format in line with CNST | MGG Maternity Governance | June 2013 |
| 3 | September 2010 | Minor changes from CNST feedback | MGG | Sept 2013 |
| 4 | 18 th March 2011 | Minor change re CNST | MGG | March 2014 |
| 5 | 21 st April 2011 | Minor change | MGG | April 2014 |
| 6 | 24 th August 2011 | Minor change to practice | MGG | August 2014 |
| 6.1-6.5 | 29 th August 2012-25 th October 2013 | Version boxes amalgamated. See version 7.0 for full details | MGG | August 2014 |
| 7.0-7.6 | 2 nd September 2014-28 th November 2016 | Version boxes amalgamated. See version 7.6 for full history | MGG Maternity Governance | Sept 2017 |
| 8 | 13 th February 2018 | Full review- Updated following NICE (2017) EFM guideline changes. Addition of FBS guidance | MGG Maternity Governance | February 2023 |
| 9 | 3 rd July 2020 | Full review to reflect advice from NHSi review Change from NICE to FIGO/physiology | MGG Maternity Governance | July 2025 |
| 9.1 | April 2021 | Revisions to section 10.2 introduction of IV oxytocin review stickers (appendix 5) and IV oxytocin management plan stickers (Appendix 6). | MGG Maternity Governance | July 2025 |
| 10 | April 2022 | Full Review | Maternity Governance | April 2025 |

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| 10.1 | July 2022 | Minor change at request of Ockenden and case review | Maternity Governance | April 2025 |
| 11 | 27 th June 2023 | Full Review to include fetal monitoring guideline update from NICE Dec 2022 | Maternity Governance | June 2026 |
| 11.1 | | Clarity regarding EFM following IOL | HOM approval | |
| 12 | 11 th June 2025 | Full Version Review | Maternity Governance | May 2028 |
| 12.1 | 15 th August 2025 | MLU Acute hypoxia proforma added (appendix 4). | Maternity Governance | May 2028 |

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Acknowledgment

This guideline is based on [Physiological CTG Interpretation – Intrapartum Fetal Monitoring Guideline](#) February 2018. Please refer to this guideline for further information regarding fetal physiology and CTG interpretation.

This guideline will be read in conjunction with – this list is not exhaustive:

- [Maternity Specific Training Guideline \(inc Training Needs Analysis\) \(168\)](#)
- [Care in labour on consultant unit \(086\)](#)
- [Antenatal Fetal monitoring \(003\)](#)
- [Care in Labour on A Midwife Led Unit or Homebirth](#)
- [Chorioamnionitis \(Including pyrexia in labour\)](#)

1.0 Introduction

'In this guideline we use the terms 'woman' or 'mother' throughout. These should be taken to include people who do not identify as women but are pregnant or have given birth'.

- 1.1 The Maternity Governance team acknowledge that this is a move away from NICE guidance. The main difference is that it requires the clinician to analyze the CTG changes in the context of fetal physiology and therefore decide why a change has occurred and the appropriate management rather than the simple pattern recognition NICE describes.
SaTH will not be an outlier in this approach. There are multiple units around the country who made the transition away from NICE many years ago.
- 1.2 Fetal monitoring in labour is used to confirm fetal wellbeing and identify those babies at risk of compromise.
- 1.3 Continuous electronic fetal monitoring (EFM) is advised when risk factors have been identified. It will not be used routinely for women at low risk of complications or hypoxia in established labour.
- 1.4 The focus of care will remain on the woman rather than the cardiotocograph trace (CTG). Considering the woman's preferences, any antenatal and intrapartum risk factors, the current wellbeing of the woman and unborn baby and the progress of labour.

2.0 Aim(s)

- 2.1 To identify fetal hypoxia before it is sufficient to cause poor long-term neurological outcomes for babies.
- 2.2 To enable timely intervention and early delivery of fetuses that become compromised during labour.

3.0 Objectives

- 3.1 To identify those women who will receive continuous EFM during labour.
- 3.2 To provide clear guidance on appropriate record keeping with EFM.
- 3.3 To set out the process for undertaking EFM & IA (Intermittent Auscultation) in labour and interpreting the features of the FH (Fetal Heart) in a standardised manner.
- 3.4 To provide guidance on management of abnormal fetal heart rate (FHR) traces.

4.0 Definitions

FHR - Fetal heart rate

EFM - Electronic Fetal Monitoring which is a recording of the FHR, generated from either ultrasound detection of FHR by an abdominal transducer or from fetal cardiac electrical activity via a fetal scalp electrode (FSE).

IA - Intermittent Auscultation

> above/more than

≥ equal or above

Continuous EFM – Is a continued CTG monitoring of both the fetal heart rate and uterine activity.

Tier 1 - Higher or equivalent to FY2, GPVTS, ST/CMT/CST 1-2

Tier 2 - Higher or equivalent to ST/CMT/CST 3-7

Tier 3 - Consultant obstetrician or equivalent

Delivery Suite Co-ordinator - Band 7 midwife with overall responsibility for co-ordinating care on Delivery Suite

FSE - Fetal scalp electrode

BMI - Body Mass Index

MEOWS - modified early obstetric warning score

VE- Vaginal examination

5.0 Process

5.1 Clinical Risk Assessment

Refer to “[Care in Labour on a Consultant Unit](#)” or “[Care in Labour on MLU/Homebirth](#)” guideline for full risk assessment process.

- A structured risk assessment will take place at commencement of labour in all care settings and will be documented on Badgernet. This risk assessment should be revisited throughout labour as part of a holistic review. This risk assessment will determine which method of monitoring will be offered. Refer to table 1. If risk factors present during labour and birth the woman will be advised that CEFM is indicated. See table 2. Risk assessment is a continual process, undertaken at least hourly, and will be updated on Badgernet accordingly. The method of FHR monitoring may change during the course of labour due to new risk factors. Women will be made aware of this process.

5.1.1 Discussion

- All women will have had access to the patient information leaflet “Listening to your baby during labour” available via the BadgerNotes leaflet library.
- Confirm with the woman which method of fetal monitoring has already been advised as part of her personalised care plan
- Following risk assessment, a discussion will take place with the woman and birthing companion(s), explaining the reasons why a certain method of monitoring is recommended. (**Intermittent auscultation is recommended for low-risk women in established labour in any birth setting. See [Table 1](#) for indications for EFM**).
- The woman’s decision about fetal monitoring will be supported. If the woman declines the recommended monitoring, the co-ordinator will be informed, who will discuss the risks, benefits and alternatives with the woman and her birthing companion(s), giving opportunity to ask questions; the discussion and the decision will be documented on Badgernet.
- **Where EFM is indicated:**
 - The midwife will explain that a CTG is used to monitor the baby’s heartbeat and labour contractions. Changes to the baby’s heart rate pattern during labour are common and do not necessarily represent an underlying problem with the health of the baby.
 - Explain that a normal trace is reassuring and indicates that the baby is coping well with the labour
 - However, if the trace is not normal, then there is less certainty about the condition of the baby and further continuous monitoring is recommended. Decisions about whether to act will be based on several factors and the developing clinical picture including findings from the CTG.

Intermittent Auscultation- Process

- Palpate the abdomen to ascertain the presentation and position of the baby (include SFH and record on the Customised Growth Chart, if not already undertaken on admission).
- Assess contractions length, strength and frequency.
- Ask about the pattern of fetal movements. If there are any changes or a reduction in fetal movements EFM will be advised. There should be an obstetric review.
- Auscultate the FH with a Pinard or handheld Doppler. Palpate the maternal pulse rate to differentiate between the two heart rates.
- Auscultate for 1 minute in between contractions to establish the fetal heartrate baseline.
- Then listen for at least 1 minute immediately after a palpated contraction, prior to and after a VE.
- If a Midwife identifies any concerns with a fetal heart during intermittent auscultation in an MLU or at home, the woman will be advised to transfer to the Consultant unit for a CTG and Obstetric review.
- **During the 1st stage of labour IA will be undertaken immediately after a contraction for 1 minute at least every 15 minutes.**
- **If a woman exhibits signs of full dilatation and where it has been decided to not undertake a VE to confirm this, staff should undertake IA at least every 5mins on the assumption that she is approaching or is at full dilatation.**
- **During the second stage of labour IA will be undertaken following a contraction at least every 5 minutes. The maternal pulse will be palpated simultaneously to differentiate between the fetal and maternal heart rates.**
- **IA will occur at irregular intervals to fall in line with contractions, as these do not occur exactly every 15/5 mins.**

If you are unable to auscultate the FH for ANY reason at the required intervals, (eg maternal/fetal positioning or frequency of contractions) auscultation MUST be repeated at the earliest opportunity and the reason for delay documented.

DO NOT wait until the next 5/15 min interval.

- If there are concerns about differentiating between the 2 heart rates the woman will require further review and a CTG. This may require transfer to the delivery suite if the woman is in labour at home or an MLU.
- The fetal heart will be documented as a single rate.
- Document any accelerations or decelerations if heard (See table 3). In the second stage of labour, transfer should be considered if decelerations heard. Unless delivery is imminent i.e. the head is crowning, assistance should be sort for transfer to obstetric consultant lead unit. If the head is crowning, there should be an assessment made for episiotomy in order to expedite birth.
- A 4 hourly holistic Peer review by another midwife will be undertaken. This may be required sooner if there are concerns. The fetal monitoring labour review form will be used on badgernet. The findings of this assessment will be discussed with the woman and her birthing companion.
- If EFM has been started because of concerns arising from intermittent auscultation, but the trace is normal after 20 minutes, an obstetric review will be sought prior to resuming intermittent auscultation.
- The woman and their birthing partner will be informed about what is happening if additional advice or review is sought by a senior midwife or Obstetrician.

Tables - Indications for EFM

Table 1- Identification of women for whom Continuous EFM is recommended:

| Maternal Indication | Fetal Indication |
|---|--|
| Gestation < 37 or > 42 weeks | Abnormal Doppler artery velocimetry |
| Induced*or augmented Labour | Multiple pregnancy (all babies to be monitored) |
| Administration of oxytocin | Anhydramnios or polyhydramnios |
| Fresh blood, or Blood stained liquor not associated with vaginal examination, that is likely to be uterine in origin | Malpresentation (including cord presentation) |
| Maternal illness (e.g. diabetes, cardiac, renal, hyperthyroidism). ** | Meconium stained liquor |
| Pre-eclampsia or suspicion of pre-eclampsia; A reading of 2+ protein on urinalysis and a single reading of either raised systolic blood pressure (140mmHg or more) or raised diastolic (90mmHg or more) | Fetal growth restriction (EFW below 3rd centile), or small for gestation age (EFW below 10th centile) with other high-risk features e.g. abnormal doppler, reduced liquor volume, reduced growth velocity. |
| BMI ≥40 | Large for gestational age |
| Previous caesarean birth or full thickness uterine scar or myomectomy) | Suspected chorioamnionitis or sepsis Temperature of ≥38°C once or ≥37.5°C on 2 consecutive occasions 1 hour apart |
| Contractions > 5:10 or lasting for more than 90 seconds | Reduced fetal movements in the 24 hours prior to the onset of regular contractions or recurrent reduced fetal movements after 28 weeks **** |
| Maternal request | Two-vessel cord |
| Prolonged rupture of membranes > 24 hours unless in active labour *** | Any fetal heart rate concerns |
| Maternal pulse >120bpm on 2 occasions 30 minutes apart | Fetal structural abnormalities diagnosed during the antenatal period and planned for CEFM |
| Pain reported by the women that appears, based on her description or previous experience, to differ from the pain normally associated with contractions | Unable to auscultate the fetal heart rate for a full minute due to frequency of contractions |
| During / following insertion of an epidural block | |
| A confirmed delay in the first stage or second stage of labour | |

*** If the pregnancy is induced with either cervical ripening balloon or Amniotomy and there are no other indications for continuous monitoring, EFM in labour is not indicated. When Prostaglandins have been given, continuous EFM will be indicated.**

****** Monitoring as per consultant formulated plan.

******* Extra vigilance should be taken to ensure no signs of infection, there should be a low threshold for transferring to CEFM.

******** If has one single episode of RFM between 37+0 and 38+6, with no additional risk factors and attends in spontaneous labour over 24 hours following RFM episode, would still be suitable for IA and MLU care. If the woman has additional risk factors as outlined in RFM guideline would not be suitable for IA or MLU care in labour.

Table 2- Indications to convert to continuous EFM

| | |
|--|---|
| Maternal pulse over 120 beats/min on 2 occasions 30 minutes apart | Pyrexia 38 °C on one occasion ≥37.5 °C on two consecutive readings 1 hour apart |
| Raised BP in labour- single systolic ≥160mmHg OR single diastolic reading ≥110mmHg | Raised BP in labour- either raised systolic BP ≥ 140 mmHg or diastolic BP ≥ 90mmHg on 2 or more consecutive readings 30 minutes apart |
| 2+ of protein on urinalysis & raised BP reading (systolic or diastolic) | |
| Confirmed Delay in the first or second stage of labour. | Concerns regarding the fetal heart rate- Refer to table 2 |
| Meconium liquor noted | |
| Contractions that last longer than 60 seconds (hypertonus), or > 5 contractions in 10 minutes (tachysystole) | Rupture of membranes >24 hours if not in active labour |
| Epidural | Maternal request |
| Commencing oxytocin | Fresh blood, or blood stained liquor not associated with vaginal examination, that is likely to be uterine in origin |
| Suspected chorioamnionitis/sepsis | Pain reported by the woman that differs from the pain normally associated with contraction |

The table above is not exhaustive; there may be other occasions where CEFM is indicated. If unsure, discuss with delivery suite co-ordinator/obstetrician.

Table 3- Fetal heart rate findings, actions and when to convert to continuous EFM

| Feature | Normal Parameters | Information |
|---------------|--|---|
| Baseline Rate | 110-160bpm Is this baseline appropriate for gestation? Is this baseline appropriate for this baby? | <ul style="list-style-type: none"> FH rate under 110bpm lasting > 3 mins when the rate has previously been normal, is suggestive of a prolonged deceleration or bradycardia and is an indication for continuous EFM. FH ≥ 160bpm following 3 contractions is suggestive of a tachycardia and is an indication for continuous EFM. A rise in the baseline of 10% is an indication for CEFM |
| Accelerations | Present (not always present in active labour) | <ul style="list-style-type: none"> Usually coincide with fetal movements detected by the mother and/or health care professional and are a sign of fetal wellbeing. Accelerations occurring after a contraction are not usually associated with fetal movement and auscultation throughout the next 3 contractions should occur, to rule out overshoot. If overshoot is suspected then continuous EFM is advised. |
| Decelerations | No decelerations should be heard | <ul style="list-style-type: none"> If any doubt, auscultation should be continued before, during and after least 3 contractions for confirmation. Repetitive or prolonged decelerations (>3mins) are an indication for continuous EFM. Decelerations may occur when the mother is supine causing aortocaval compression. If changing the maternal position does not quickly revert the situation then continuous EFM will be indicated. |

- The table above is not exhaustive; any condition which is thought to increase the risk of fetal hypoxia mandates CEFM. In addition to these women CEFM is required where it forms part of a personalised care plan.
- EFM will not be used routinely before 26 completed weeks' gestation. It may be used when requested by a Tier 3 or Middle Grade Obstetrician if the CTG findings will influence ongoing care.

5.3

Continuous Electronic Fetal Monitoring – The Process

5.3.1 Commencing CTG

- Ask about fetal movements over the preceding 24 hours
- Palpate the abdomen to ascertain the presentation and position of the baby. (Include SFH and record on GROW chart, if not already taken on admission)
- Differentiate the heartbeat from maternal pulse.
- If concerns about differentiation between maternal and fetal heart rate, or the fetal heart rate cannot be heard, obtain an urgent review by a Tier 2/3 obstetrician or a senior midwife.
- Ensure correct date and time on CTG monitor and printer speed is set to 1cm/minute.

Minimum data that will be recorded at the beginning of the CTG:

- Woman's name
 - Hospital unit number
 - Date and time
 - Maternal pulse
 - Name/Signature of the midwife starting the trace
- "Commencing CTG" stickers are available to aid this.

5.3.2 Telemetry

Telemetry will be available on delivery suite for those wishing to use it. If there is signal loss, then it will be switched to wired transducers as soon as possible in order to confirm if there is a clinical problem or not.

Telemetry can be used for women wishing to use the birth pool. FSEs attachments are not validated for use in any water, therefore are not for use in the cases of pool births or use of water for analgesia.

5.3.3 Assessment of EFM

An assessment 30 minutes after the CTG has been commenced is undertaken to exclude chronic hypoxia and existing fetal injury. This may be undertaken sooner and earlier escalation if the CTG shows concerning features or indicates hypoxia.

Complete the sticker below and place on the back of the CTG print out, if checklist unavailable on badgernet.

| | | | |
|---|---|-------|----|
| Date- | | Time- | |
| Checklist to exclude chronic hypoxia and pre-existing fetal injury | | | |
| 1 | Baseline fetal heart rate appropriate to gestational age | Yes | No |
| 2 | Normal variability and cycling | | |
| 3 | Presence of accelerations (not in labour or latent phase of labour) | | |
| 4 | Shallow/late decelerations | | |
| 5 | Consider the wider clinical picture: meconium, temperature, fetal growth, reduced fetal movements | | |
| Overall impression: Normal / Chronic Hypoxia / Other: | | | |
| Management Plan: | | | |
| Signature: | | | |

When the woman is in active labour, or has commenced oxytocin, an assessment of fetal welling will be undertaken after 1 hour and repeatedly

hourly until the birth of baby. (More often if concerns)

5.3.3.1 The holistic assessment

- An hourly systematic review of maternal and fetal wellbeing (including review of any antenatal or intrapartum risk factors), and a review of the CTG (taking into consideration- previous FHR monitoring results, previous traces, and any changes in baseline fetal heart rate, variability or decelerations.) This review will be documented on the “**fetal monitoring labour review**” form on badgernet. See Appendix 1.
- Fresh eyes/Peer reviews will also be undertaken in the labour room every hour as part of this holistic review. Fresh eyes assessments **should not** be undertaken retrospectively.
- The findings of this assessment will be discussed with the woman and her birthing companion.
- If circumstances delay the CTG/holistic assessment, the reason for this will be documented in Badgernet along with an action plan for getting the review completed.
- EFM of multiple pregnancies will include an assessment for each fetus.

5.3.3.2 Considerations

- The woman and her birthing partner will be informed about what is happening if additional advice or review is sought by a senior midwife or obstetrician.
- It is possible to monitor maternal pulse throughout CEFM with pulse oximeter, or through the wired tocodynamometer and to be recorded hourly and differentiated from fetal heart rate.
- A lower threshold will be considered for escalation when there are any antenatal or intrapartum risk factors that could lead to fetal compromise.
- Ensure the CTG trace is of high quality, and if not, take action to improve the trace (for example, by repositioning the tocodynamometer, the transducer, or by using FSE).
- The interpretation of CTG traces in the second stage of labour is more challenging than the first stage of labour and should therefore have a lower threshold for escalation. Hypoxia is both more common and more rapid in active second stage, a lower threshold for escalation to an Obstetrician is advised.
- If fetal heart rate accelerations are recorded in the second stage of labour, these are most likely to be maternal pulse action must be taken to check whether maternal or FHR is being detected.
- Take the whole clinical picture into account when making decisions on how to manage the labour, including maternal observations, contraction frequency and labour progress.

5.3.4 CTG Features

As part of the CTG review, each of these features will be assessed, incorporating antenatal and intrapartum risk factors. The purpose of doing so will aid detection of hypoxia/ infection/ chorioamnionitis.

CTG assessments will be documented on Badgernet using the fetal monitoring labour review tool & CTG review tool, as discussed in section 5.3.3 & 5.3.3.1. Refer to Appendix 1 if there are differing opinions of the CTG assessment.

Be aware that if the CTG parameters of baseline fetal heart rate and baseline variability are stable, the risk of fetal acidosis is low. NICE 2022, FIGO 2015

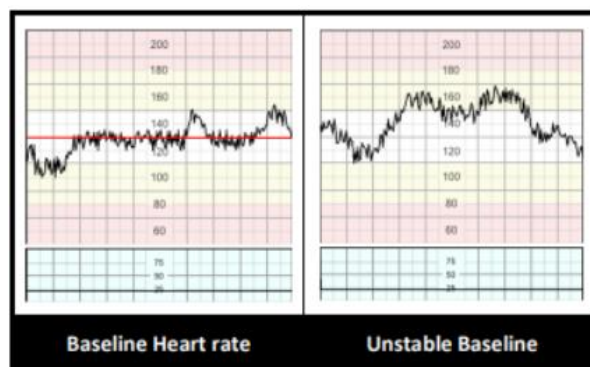
5.3.4.1 **Baseline Heart Rate**

Definition: Mean fetal heart rate rounded to five beats per minute during a ten-minute segment, excluding accelerations, decelerations, and marked FHR variability.

- Consider whether the baseline is appropriate for the gestation.
- Compare baseline rates on previous CTGs.
- A change in baseline (by >10%) signifies a need for further attention. (Examples of a 10% rise in Baseline would be a 110bpm baseline rising by 10 bpm or 150 bpm rise by 15bpm.) *
- In the presence of chronic hypoxia, more subtle changes to the baseline will also be considered significant.

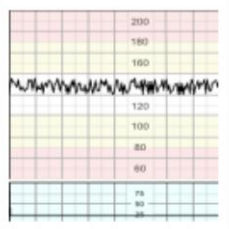
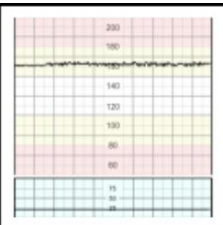
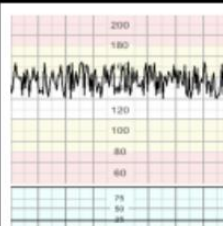
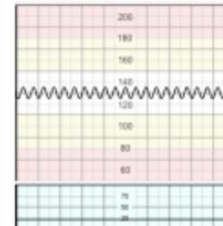
* A rise in baseline may be caused by infection, hypoxia or maternal dehydration; measures should be taken to address such possibilities. (oral/IV rehydration, monitor maternal temperature more frequently and take appropriate action). These are the most common causes. There are some much rarer causes such as maternal drug use (both illicit and prescribed), fetal heart arrhythmias or fetal hyperactivity. Also refer to guideline: [Chorioamnionitis](#)

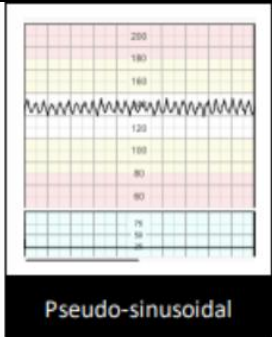
| | |
|------------------------|---|
| Normal Baseline | Between 110 and 160 bpm, with variations for preterm and post-term fetuses. A stable baseline is a critical feature, if you are unable to determine the baseline due to instability, an urgent obstetric review will be sought. |
| Tachycardia | Baseline above 160 bpm lasting over 10 minutes. |
| Bradycardia | Baseline below 110 bpm lasting over 10 minutes, values between 90 and 110 bpm may occur in a normal fetus, in these circumstances seek senior obstetric review for a holistic review. |



5.3.4.2 Variability

Definition: Determine variability by looking at the minor oscillations in the fetal heart rate, which usually occur at 3 to 5 cycles a minute. Measure it by estimating the difference in beats per minute between the highest heart rate and the lowest heart rate in a 1-minute segment of the trace between contractions, excluding decelerations and accelerations.

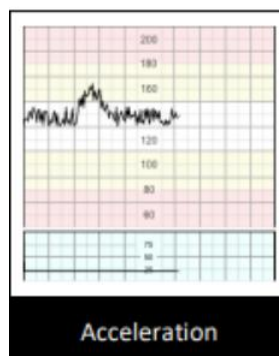
| | | |
|--------------------------------------|---|--|
| Normal | 5 – 25 bpm |  Normal Variability |
| Reduced | Below 5 bpm for more than 50 minutes in baseline segments or over 3 minutes during decelerations. Intermittent periods of reduced variability are normal, especially during periods of sleep. (Sleep cycles) |  Reduced Variability |
| Absent | Undetectable with or without fetal decelerations. If there is an absence of variability, carry out a review of the whole clinical picture with a low threshold for expediting birth, as this is a very concerning feature. | |
| Increased (Saltatory Pattern) | <ul style="list-style-type: none"> Exceeds 25 bpm for over 30 minutes. Linked with recurrent decelerations, possibly due to fetal autonomic instability/hyperactivity. May indicate hypoxia; intervention may be needed sooner during the second stage or decelerations. May indicate chorioamnionitis. (See guideline) |  Saltatory Pattern |
| Sinusoidal Pattern | <ul style="list-style-type: none"> Regular, smooth, undulating signal lasting over 30 minutes with absent accelerations. Associated with fetal anaemia, fetal-maternal haemorrhage, twin-to-twin transfusion syndrome, acute fetal hypoxia, infection, cardiac malformations and hydrocephalus (amongst others). Where a sinusoidal pattern is present, inform neonates when attending birth and ensure the fetal haemoglobin is checked via cord gases to investigate for |  Sinusoidal Pattern |

| | | |
|--------------------------|--|---|
| | fetal blood loss. | |
| Pseudo-sinusoidal | <ul style="list-style-type: none"> • Resembles sinusoidal pattern with a slightly jagged appearance, rarely lasting beyond 30 minutes. • Normal patterns usually seen before and after, and may include accelerations. • Associated with fetal sucking, and other mouth movements. • Can be difficult to distinguish from a true sinusoidal pattern • Seek co-ordinator or obstetric review if unsure. |  |

5.3.4.3 Accelerations

Definition: Sudden increases in Fetal Heart Rate, reaching peak within 30 seconds, exceeding 15 bpm from baseline, lasting over 15 seconds but less than 10 minutes.

- The presence of accelerations is generally considered to be a reassuring feature.
- The absence of accelerations on an otherwise normal CTG trace does not indicate fetal acidosis.
- **Note:** Before 32 weeks gestation, the rise and duration of accelerations may be lower.
- Accelerations should start from, and return to, a stable baseline.
- **CAUTION:** In the second stage of labour, if accelerations are recorded, be aware these are most likely to be maternal pulse: Use of a saturation probe to monitor maternal heart rate can aid differentiation.



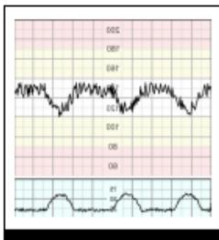
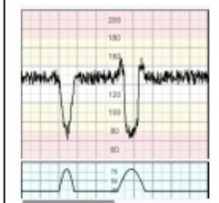
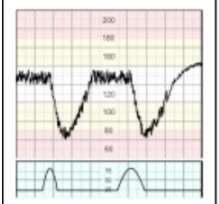
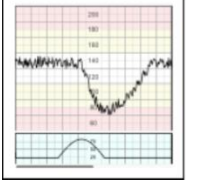
5.3.4.4 Decelerations

Definition: Decrease in Fetal Heart Rate below baseline, exceeding 15 bpm, lasting over 15 seconds.

- Decelerations are a reflex response to protect myocardial workload during fetal hypoxia or a mechanical stress to maintain aerobic metabolism in the myocardium.

When making assessments, consider:

- Their timing in relation to the peaks/duration of contractions
- The duration of each deceleration
- Whether the FH returns to the baseline rate
- How long the decelerations have been present for
- The presence/absence of shouldering
- Variability within the deceleration

| Types of decelerations | | | |
|------------------------|---------------|--|---|
| Early | Baroreceptor | <ul style="list-style-type: none"> • Gradual onset and returning to baseline • Normal variability within the deceleration • Coincide with contractions, associated with fetal head compression. • Occur in late first and second stages. • Do not indicate fetal hypoxia/acidosis |  <p>Early Decelerations</p> |
| Variable | Baroreceptor | <ul style="list-style-type: none"> • Most common type of deceleration witnessed in labour • V-shaped with a rapid drop (<30s) and recovery. • Result from cord compression. • Usually not associated with fetal hypoxia unless evolving into a U-shaped pattern. • If variable decelerations persist and other CTG changes are present, seek urgent obstetric review as there is risk of fetal compromise/acidosis. |  <p>Variable Decelerations</p> |
| Late | Chemoreceptor | <ul style="list-style-type: none"> • Gradual onset and/or gradual return to the baseline and/or reduced or increased variability within the deceleration. • Begin >20s after the contraction onset, return to baseline after the contraction has ended. • Chemoreceptor response to fetal hypoxemia. • Note: In a trace with no accelerations and reduced variability, a late deceleration also includes those with a 10-15 bpm drop (shallow) |  <p>Late Decelerations</p> |
| Prolonged | Chemoreceptor | <ul style="list-style-type: none"> • Last more than 3 minutes, likely indicating hypoxemia. • Exceeding 3 minutes with an FH <80 bpm and reduced variability requires urgent intervention. Call emergency bell. |  <p>Prolonged Deceleration</p> |

5.3.5 Contractions

5.3.5.1 Definitions

These are recorded with the tocodynamometer, only the frequency of contractions can be reliably evaluated. (FIGO 2015) The intensity and duration of contractions may be assessed by manual palpation. If frequency of contractions cannot be assessed reliably by the tocodynamometer, manual palpation for 10 minutes every 30 minutes is required

- **Tachysystole** This is defined as uterine activity of 5 or more contractions per 10 minutes for at least 20 minutes, which may or may not be associated with fetal heart rate changes, in the case of spontaneous, physiological labour.
- **Hyperstimulation-** This is overactivity of the uterus as a result of induction of labour. It is variously defined as uterine tachysystole (more than 5 contractions per 10 minutes for at least 20 minutes) and uterine hypersystole/hypertonicity (a contraction lasting at least 2 minutes). These may or may not be associated with changes in the fetal heart rate pattern (persistent decelerations, tachycardia or increased/decreased short term variability). (NICE, 2023).

5.3.5.2 Actions

If tachysystole **or** hyperstimulation are evident, a full risk assessment & review by a Tier 2/3 will be undertaken and corrective measures will be considered to address underlying causes. The woman may require additional pain relief, this will be addressed. The woman will be informed of all findings and actions taken.

Note: If an **oxytocin infusion** is in progress and the woman has contractions more frequently than 4 in 10 minutes, reduce or stop the oxytocin until the woman is having 4 or fewer contractions in 10 minutes. Refer to [Care in Labour on a Consultant Unit](#) guideline for more information on oxytocin use.

Terbutaline

Used to treat tachysystole/hyperstimulation (unless contra-indicated)

| | |
|----------------------------|--|
| Regimen | Terbutaline 0.25mg Subcutaneous Injection. A second dose may be given following discussion with a Tier 3. There is no agreed period of time between the doses. |
| Cautions | Arrhythmias, maternal or fetal cardiovascular disease (discuss with anaesthetist/cardiologist/fetal medicine consultant), diabetes (risk of hyperglycaemia and ketoacidosis), mild to moderate hypertension, hyperthyroidism, hypokalaemia, susceptibility to QT-interval prolongation. Women with diabetes may have an increase in blood sugars and could lead to neonatal hypoglycaemia. |
| Contraindications | Suspected abruptio placenta, antepartum haemorrhage, eclampsia or severe hypertension (BP > 160/110mmHg), maternal or fetal cardiovascular disease (discuss with anaesthetist/cardiologist/fetal medicine consultant), intra-uterine fetal death, intra-uterine infection, placenta praevia, pulmonary hypertension, significant risk factors for myocardial ischaemia, threatened miscarriage |
| Common side effects | Maternal tachycardia, fetal tachycardia, flushing, tremors and palpitations. Arrhythmia, headaches, hypokalaemia, hypotension, muscle spasms, and nausea. |
| Uncommon | hyperglycaemia |
| Rare | myocardial infarction, vasodilation, paroxysmal bronchospasm |

Table 4-Hypoxic features and management

| Hypoxia | Features | Management |
|---|---|--|
| No Hypoxia | <ul style="list-style-type: none">Baseline appropriate for G.ANormal variability and cyclingNo repetitive decelerations | <ul style="list-style-type: none">Consider whether the CTG needs to continueIn continuing the CTG, perform routine hourly reviews and document on Badgernet |
| Evidence of Hypoxia | | |
| Chronic Hypoxia | <ul style="list-style-type: none">Higer baseline than expected for G.AReduced variability and/or absence of cyclingAbsence of accelerationsShallow decelerationsConsider the clinical indicators: reduced fetal movements, thick meconium, bleeding, evidence of chorioamnionitis, postmaturity, IUGR | <ul style="list-style-type: none">Avoid further stressUtilise chronic hypoxia and fetal injury checklist can be used to aid assessmentUrgent escalation to obstetrician and/or delivery suiteExpedite birth, if not imminent |
| Gradually Evolving Hypoxia | Compensated | <ul style="list-style-type: none">Likely to respond to conservative interventions (see below)Regular review every 30-60 minutes to assess for signs of further hypoxic change, and that the intervention resulted in improvementOther causes such as reduced placental reserve must be considered and addressed accordingly |
| | Decelerations and loss of accelerations followed by a rise in baseline (That is stable and has normal variability). | |
| | Decompensated | <ul style="list-style-type: none">Needs urgent intervention to reverse the hypoxic insult (remove prostaglandin pessary, stop oxytocin infusion, tocolysis)Delivery should be expedited, if no signs of improvement are seen |
| Subacute Hypoxia | <ul style="list-style-type: none">More time spent during decelerations than at the baselineMay be associated with saltatory pattern (increased variability) | First Stage |
| | | <ul style="list-style-type: none">Remove prostaglandins/stop oxytocin infusionIf no improvement, needs urgent tocolysisIf still no evidence of improvement within 10-15 minutes, review situation and expedite birth |
| | | Second Stage |
| | | <ul style="list-style-type: none">Discourage maternal active pushing during contractions until improvement is notedIf no improvement is noted, consider tocolysis if birth is not imminent or expedite birth via operative vaginal birth |
| Acute Hypoxia | Prolonged decelerations (> 3 minutes) | Preceded by reduced variability and lack of cycling or reduced variability within the first 3 minutes |
| | | Immediate birth by the safest and quickest route |
| | | Preceded by normal variability and cycling and normal variability during the first 3 minutes of the deceleration (see Appendix 2- 3 minute rule) |
| | | <ul style="list-style-type: none">Exclude the 3 accidents (cord prolapse, placental abruption or uterine rupture- if an accident is suspected, prepare for immediate birth)Correct reversible causesIf no improvement by 9 minutes or any of the accidents diagnosed, immediate birth by the safest and quickest route |
| Unable to Ascertain fetal wellbeing (Poor signal quality, uncertain baseline, probable recording of maternal heart rate) | | <ul style="list-style-type: none">Escalate to senior teamConsider adjunctive techniques, if appropriate (ie, Fetal Scalp Stimulation)Consider the application of FSE to improve signal quality |

5.3.6 Conservative measures for Gradually Evolving and Subacute Hypoxia:

- Identify reversible causes as alleviating them can lead to subsequent recovery of adequate fetal oxygenation and the return to a normal trace.
- When CTG changes develop, it is important to address underlying causes before hypoxia occurs.
- The midwife caring for the woman should escalate to a senior midwife/obstetric team for review without delay.

5.3.6.1 Excessive uterine activity (most frequent cause)

- Could be detected by palpating the uterine fundus assessing the frequency, strength and duration of contractions and the tone in between.
 - It can usually be reversed by
 - Reducing or stopping oxytocin
 - Removing administered prostaglandins
 - Starting acute tocolysis with beta-adrenergic agonists (terbutaline) or nitro-glycerine
 - During the second stage of labour, maternal pushing efforts can also contribute to fetal hypoxia/acidosis and the mother can be asked to stop pushing until the situation has improved. FIGO 2015
 - If this does not improve the trace, delivery should be expedited.

Important note: Due to the longer half-life of prostaglandins, hyperstimulation usually requires the removal of the pessary and administration of tocolytics at the same time, especially when dealing with acute hypoxia.

5.3.6.2 Aorto-caval compression

- Can occur in supine position.
- Turning the mother to lateral or upright positions may relieve compression.

5.3.6.3 Transient cord compression

- (variable decelerations) can sometimes be relieved by changing maternal position

5.3.6.4 Sudden maternal hypotension

- most frequently occurs after spinal or epidural administration.
- This is reversible by rapid fluid administration \pm I.V. ephedrine bolus (by the anaesthetic team)

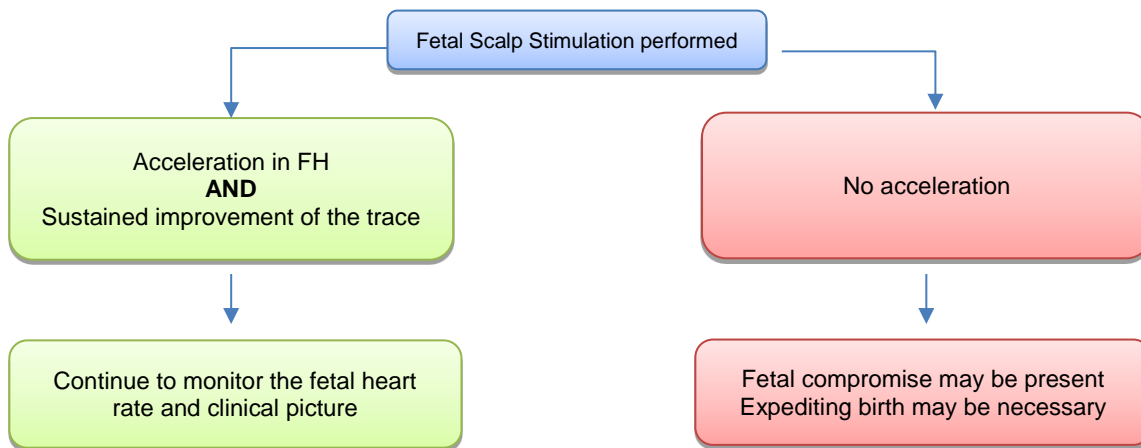
5.3.7 Fetal Scalp Stimulation (FSS)

In situations where changes to the CTG cannot be explained, FSS can be used to aid assessment of fetal wellbeing.

FSS involves stimulating the fetal scalp by rubbing it with the examiner's fingers. Digital scalp stimulation is the most widely used as it is the easiest to perform, least invasive, and appears to have a similar predictive value for fetal hypoxia/acidosis to the other alternatives. FIGO 2015

If this leads to acceleration in FHR, and **sustained improvement** on the trace, continue to monitor the fetal heart rate and clinical picture.

Be aware that the absence of an acceleration in response to FSS is a worrying sign that fetal compromise may be present and expediting birth may be necessary (NICE, 2022)



Supporting Evidence. There are many observational studies supporting the use of fetal scalp stimulation (FSS) compared to fetal blood sampling. However, the evidence grading for the trials behind the use of FSS is predominantly moderate to low.

Limitation. There is no consensus on the clinical situation for FSS to be used. FIGO 2015

Fetal Scalp Blood Sampling

Fetal blood sampling is not supported by either NICE (2022) or Physiological guideline (2018) due to limited evidence.

5.3.8 Special circumstances

5.3.8.1 Meconium

Meconium stained liquor (MSL) can be present in a normal post term fetus without an indication that the baby has experienced hypoxia. In a preterm fetus, <34/40, the presence of meconium signifies that there is likely infection, such as listeria, ureaplasma or rotavirus.

The most severe complication is meconium aspiration syndrome (MAS). From when meconium stained liquor is noted, will CEFM will be commenced and continued throughout the whole antenatal and intrapartum period until birth. The risk of meconium aspiration increases with deceleration that are large in depth (>60bpm) or duration (>60 seconds).

In the presence of meconium the threshold for intervention with CTG concerns or changes needs to be lower.

5.3.8.2 Pyrexia – Also refer to [SaTH Adult Antibiotic Policy](#) and [Chorioamnionitis](#) and Care in Labour

- Heat transmission during pregnancy results in fetal temperature being 0.3-0.5°C higher than maternal temperature.
- If there is pyrexia, the metabolic demands of the fetal tissues are increased and so the risk of hypoxia is increased. CEFM is advised.
- Vigilance is required as the pyrexia may or may not be due to chorioamnionitis. If Chorioamnionitis is suspected, refer to [Chorioamnionitis](#) guideline.

5.3.8.3 Epidural

- EFM must be continued throughout the siting of an epidural/spinal even when challenging. An FSE will be considered, if appropriate.

- It is appropriate to pause the siting of an epidural until adequate monitoring of the fetal heart rate has resumed.
- A sudden drop in maternal blood pressure may occur (causing redistribution of maternal blood away from the placenta resulting in inadequate placental perfusion). The CTG will show signs of acute hypoxia or subacute hypoxia. It is reversible and should be corrected by changing the maternal position and IV fluids \pm I.V. ephedrine (to be administered by the anaesthetic team)
- This vasodilation can also cause an increase in maternal temperature because of altered thermoregulation.

5.3.8.4 Prematurity

There is paucity of evidence/ guidelines on the use of CTG in preterm babies. This has resulted in some experts advising against continuous monitoring in extreme prematurity (24 – 28 weeks). The key factors affecting FHR characteristics in the preterm fetus are immaturity of the central and peripheral nervous systems, reduced placental reserve, immature adrenal gland and myocardium, and reduced amount of Wharton's jelly in the umbilical cord.

CTG findings include:

- Immaturity of the autonomic nervous system will result in a higher baseline heart rate and reduced variability.
- Immaturity of the somatic nervous system may result in less accelerations being less frequent and of smaller amplitude (10bpm) and for a shorter duration (10sec). This is especially more evident at gestations before 30 weeks.
- Fetal heart rate decelerations in the absence of uterine contractions often occur in the normal preterm fetus between 20 and 30 weeks' gestation. Variable decelerations have been shown to occur in 70–75% of intrapartum preterm fetuses, in comparison to 30-50% of term fetuses.
- Immaturity of the central nervous system results in a less developed cycling pattern, this is especially more evident in extreme prematurity.
- Tier 3 should document a plan on Badgernet which is agreed with the woman and midwife if a CTG is to be used from 26-28/40.
- Refer to 5.3.7 for effect of Magnesium Sulphate and the CTG if using in cases of prematurity

5.3.9 Effect of medication on the CTG

- It is important to consider the effect of any medication administered to the mother during labour and anticipate the changes it may cause on the CTG trace.
- If there is uncertainty of the effects of medication, advice from the Tier 3 will be sought.
- **Pethidine** will not be withheld in response to CTG changes. Eg, reduced variability (alone) as hypoxia will emit other characteristics first such as preceding decelerations and baseline rise.
- **Magnesium sulphate** may be used for neurological protection of the baby. The composition of magnesium sulphate leads to neurological depression and can pass through the placenta. This can lead to a reduction in variability. If this has been noted, it is advisable to pause the magnesium sulphate temporarily to see if this would improve the variability. If it does, then reassurance can be obtained that it is the side effect of the magnesium sulphate and then can be recommenced. Any woman who has magnesium sulphate running must have CEFM, regardless of indication.

5.3.10 Fetal Scalp Electrode (FSE)

If there are concerns about whether the maternal heart rate is being heard rather than the FHR, discuss with women the methods available to differentiate and support her decision on which method to use.

FSE as a form of fetal monitoring will be recommended when:

- There is difficulty monitoring the FH using an abdominal transducer (or where this is anticipated, for example raised BMI)
- If during maternal movement, there is frequent loss of contact.
- During multiple births, to differentiate fetal heart rates
- Where the difference between maternal and fetal heart rates are 10 bpm or less. (Ultrasound scan, doppler/pinard or pulse oximetry can also be used)

(Be aware that it is particularly important to confirm the FHR in the second stage of labour, when it is easier to mistakenly auscultate maternal rate than FHR.)

This form of fetal monitoring should **not** be used when (or used with caution if):

- There is a presence of maternal infectious disease (HIV, Hep B or Syphilis)
- Fetal bleeding disorders
- Gestation <34 weeks. In these cases, a VE should be performed by a Tier 2 or 3 obstetrician and the FSE placed following assessment of the fetal scalp.
- If the risk of hypoxia is greater (due to poor monitoring) than the risks associated with those cautions above, a clear plan should be documented by a Tier 2 or Tier 3 for the use of FSE.

5.3.11 Central Monitoring:

- All intrapartum CTG's will be viewed on the large digital display screen located in the delivery suite office.
- Central monitoring **must not** replace the presence and 1:1 care provided by the midwife.
- Central monitoring can assist the delivery suite coordinator and obstetric team to maintain situational awareness acting as a visual tool to aid recognition of abnormality.
- Central monitoring will not be used to complete fresh eyes/peer reviews of the CTG. As per (section 5.3.3.1), this will be conducted in the labour room using a holistic systematic approach.

5.3.12 Storage of CTG traces:

- CTG print outs will be placed a dedicated envelope within the hospital notes.
- Stored securely for at least 25 years.
- Where concern that a baby may have sustained a possible brain injury, CTG traces will be scanned and stored (by the governance team) indefinitely in case of possible adverse outcomes. Or archived electronically.

5.4 Umbilical Cord Blood Samples – see appendix 4

Paired umbilical cord samples (arterial and venous) will be taken at delivery in the following situations or when there has been concern about fetal wellbeing in labour or if there is concern regarding neonatal wellbeing immediately after birth.

- Emergency caesarean section
- Instrumental Vaginal Delivery
- CTG concerns in labour

- Apgar score <7 at 5 mins
- Vaginal Breech Birth
- Maternal pyrexia/suspected chorioamnionitis
- Vaginal birth of multiple pregnancy
- Any birth performed under General Anaesthesia
- Following shoulder dystocia
- Preterm birth
- Neonatal wellbeing concerns at birth

Tips for accurate sampling

- Double clamp the cord promptly after birth.
- Run the sample promptly after taken from the cord
- Remove the air bubbles out of the syringes
- Don't forget to label which is the arterial and which is the venous
- Leave clamp secure until you have your results, in case you need to repeat a sample.

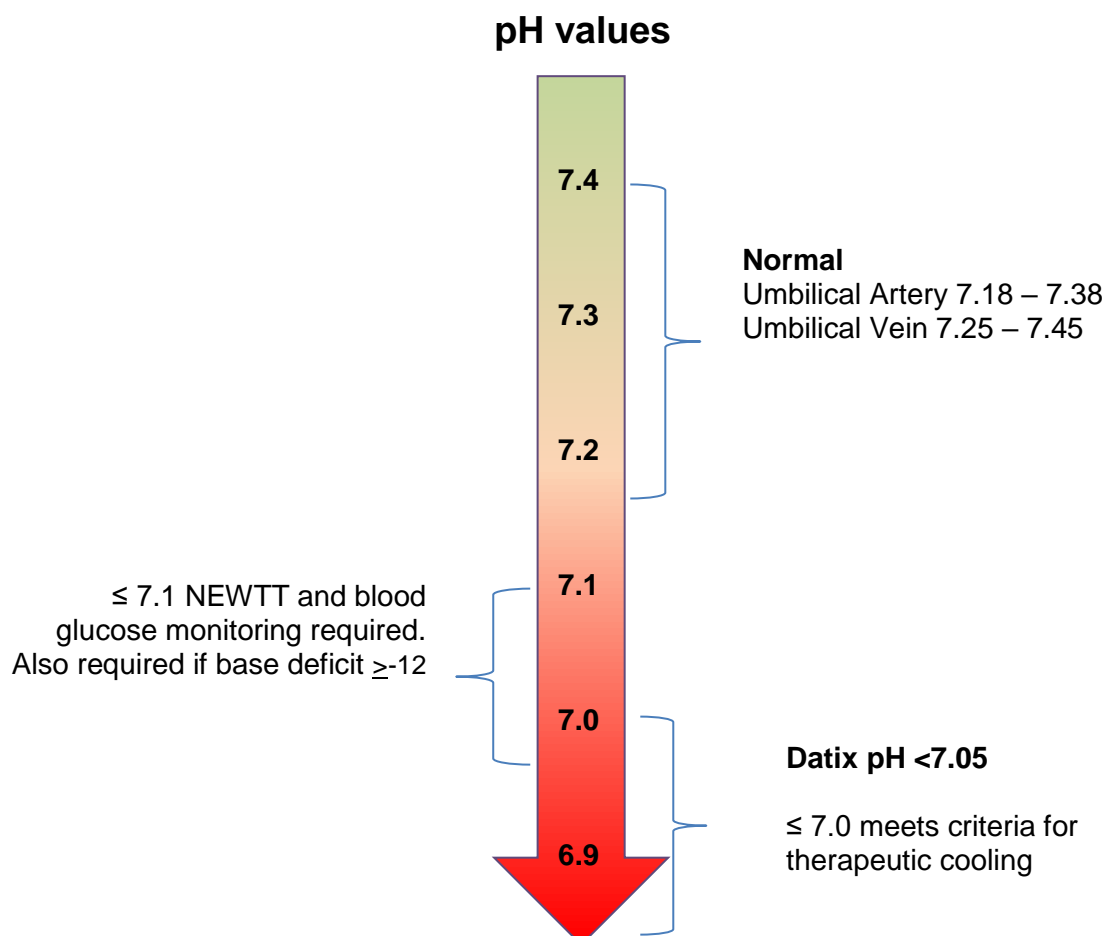
The printed results of paired umbilical cord blood samples will be filed in the maternity notes on the mount sheet marked "Fetal Blood Sampling". If these mount sheets are not available, an alternative mount sheet can be used to ensure safe filling. The results will also be recorded on Badgernet.

5.4.1 Interpreting results

Determine if the samples are paired

- pH difference should be > 0.02 units
- pco2 should be > 0.5 kPa

Values will always be lower in the arterial sample.



6.0 Training

This will be in accordance with [Maternity Specific Training Guideline with Training Needs Analysis](#).

7.0 Monitoring /Audit

“Compliance with this guideline / SOP will be audited as part of the Shrewsbury and Telford Hospital NHS Trust’s five-year rolling programme of NICE and local guideline audits, unless circumstances require an earlier or more frequent audit. The audit will be carried out using the auditable standards and the results will be reported and acted on in accordance with the Trust Clinical Audit Policy (CG25)”.

8.0 References:

BNF Formulary complete (2023) Accessed from SaTH intranet. Available at: [FormularyComplete - Home](#)

Conde-Agudelo, A., Romero, R., Jung, E. J., & Garcia Sánchez, Á. J. (2020). Management of clinical chorioamnionitis: an evidence-based approach. *American journal of obstetrics and gynecology*, 223(6), 848–869. <https://doi.org/10.1016/j.ajog.2020.09.044>

FIGO (2015) Consensus guidelines on intrapartum fetal monitoring : Cardiotocography.

FIGO (2015) Consensus guidelines on Intrapartum fetal monitoring: Intermittent Auscultation.

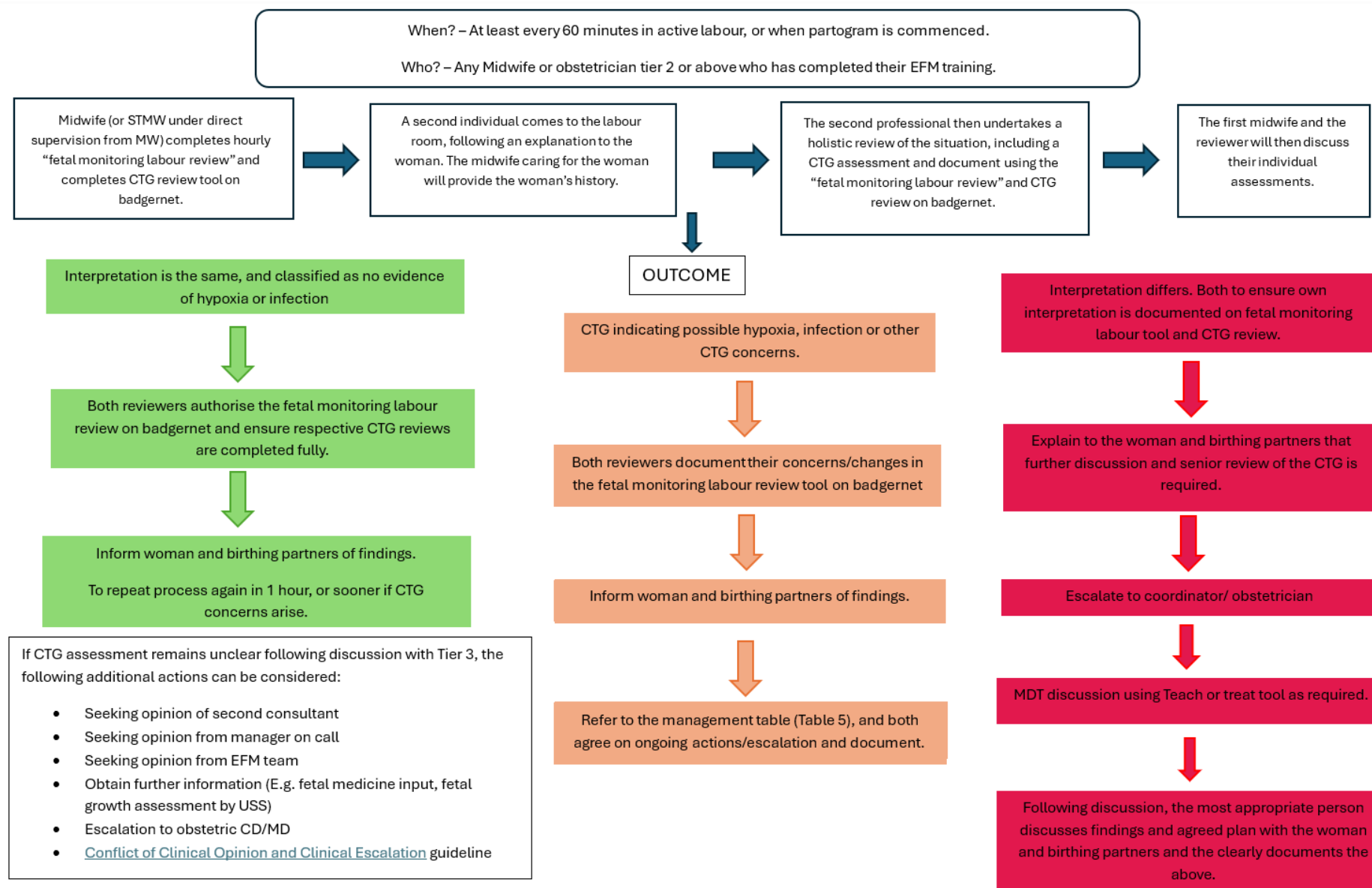
Hiranandani M, Kaur I and Grover S. (2023) Umbilical Cord Blood Gases: Sampling, Evaluation, and Application for Clinicians. *Newborn*. Volume 2, Issue 3 Jul-Sep 2023. Available at [Umbilical Cord Blood Gases: Sampling, Evaluation, and Application for Clinicians](#)

NICE (2022) Fetal Monitoring in labour London, NICE.
Physiological CTG Interpretation (Feb 2018). Intrapartum Fetal Monitoring Guideline UK.
Available at: [Physiological CTG - Guideline \(physiological-ctg.com\)](#)

NHS England (2023) Saving Babies Lives V3. Available at: [NHS England » Saving babies' lives: version 3](#)

Appendix 1

Fresh Eyes Process



Appendix 2- Acute Hypoxia 3-minute rule

1. Acute Hypoxia Kamoshita et al. 2010, Leung et al. 2009, Cahil et al. 2013

- **Presents** as a prolonged deceleration lasting for more than 5 minutes or for more than 3 minutes if associated with reduced variability within the deceleration. FIGO 2015

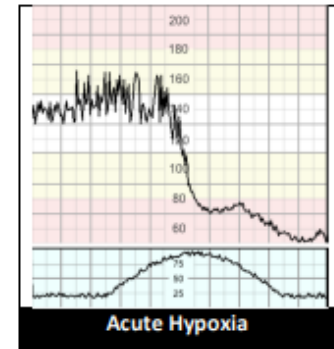
- **Causes**

- 3 Accidents

- Cord prolapse
 - Placental Abruption
 - Uterine Rupture

- 2 Iatrogenic

- Maternal Hypotension (usually secondary to supine hypotension or epidural top-up)
 - Uterine hyperstimulation (by oxytocin / PGs) or spontaneous increased activity



- **Fetal pH drops** at a rate of 0.01/min during the deceleration Gull et al. 1996

- **Management** follows the **3-Minute Rule**:

- 0 – 3: If a deceleration is noted for more than 3 minutes with no signs of recovery the emergency alarm must be raised to summon the on-call team
 - 3 – 6: Attempt to diagnose the cause of the deceleration
 - If an accident is diagnosed the aim would be for immediate delivery as soon as safely possible in the fastest route possible (AVD/CS)
 - If an iatrogenic cause is diagnosed immediate measures must be utilized to correct the changes. This includes avoiding supine position, stopping uterine stimulants, starting IV fluids, and administering tocolytics.
 - 6 – 9: Signs of recovery should be noted (return of variability and improvement in heart rate). If no signs of recovery are noted, preparation for immediate delivery **MUST** be started.
 - 9 – 12: By this point in time the deceleration has either recovered, or preparation for an assisted vaginal delivery / caesarean section is in progress aiming for a delivery of the fetus by 12 – 15 minutes.

Important Notes:

- Do not follow the 3-minute rule if the deceleration is preceded by reduced variability and lack of cycling, immediate preparation should be made to expedite delivery by the safest and fastest route possible. Williams and Galerneau 2002
- If normal variability and cycling before and during the first 3 minutes of the deceleration, it is likely that 90% will recover within 6 minutes, and 95% in 9 minutes, if acute accidents have been excluded.

Appendix 3- Acute Hypoxia Proforma

| |
|------------|
| Date _____ |
| Name _____ |

Acute Hypoxia Proforma

Does the preceding CTG have normal variability and cycling?

| | | |
|----------|--------|---|
| Normal | Yes/No | Proceed to using 3,6,9,12 rule |
| Abnormal | Yes/No | Immediate delivery by the safest and quickest route |

Time deceleration started

3 minutes

Time emergency buzzer pulled

Don't forget the risk factors! Is this baby small or preterm?

Reason if not pulled

| Actions | Time | Comments | Position Change | Time |
|-----------------------------|------|----------|-----------------|------|
| Turn off oxytocin | | | | |
| Stop pushing | | | | |
| Terbutaline 1 st | | | | |
| Terbutaline 2 nd | | | | |

| 6 minutes – Say 'We are at 6 minutes the FH is _____' | | | | Time |
|---|--------|-------|--|------|
| BP | Normal | Low | VE to exclude cord, abruption, rupture | |
| Abdomen | Soft | Rigid | | |
| Scar Pain | No | N/A | Informed theatre | |
| PVB | No | Yes | Put out '2222' call | |

| | |
|---|-------------------------------------|
| 9 minutes – Say 'We are at 9 minutes and the FH is _____' | Time entered theatre if transferred |
|---|-------------------------------------|

| Preparation for Delivery | | | |
|--------------------------------------|------|------------------------------|------|
| Action | Time | Action | Time |
| Perineum infiltration/pudendal block | | Preparation for instrumental | |
| Episiotomy | | Decision for EMCS | |

| Attendance | | Don't forget cord gases. | | | |
|---|------|--------------------------|------|------|--------------|
| Name | Role | Time arrived | Name | Role | Time arrived |
| | | | | | |
| | | | | | |
| | | | | | |
| Additional Comments/Plan for ongoing care | | | | | |
| | | | | | |

Time FH recovered to BL

Please scan into Badgernet

PP Version 2- July 23

Appendix 4 MLU Acute Hypoxia Proforma

| |
|------------|
| Date _____ |
| Name _____ |

Acute Hypoxia Proforma for MLU

Were there any IA fetal heart rate monitoring concerns?

| | | |
|--------|--------|--------------------------------|
| Normal | Yes/No | Proceed to using 3,6,9,12 rule |
| | | |

| | | | |
|---------------------------|--|------------------------------------|--|
| Time deceleration started | | 3 minutes | |
| | | Time emergency buzzer pulled | |
| Any new risk factors? | | Time of transfer to delivery suite | |

| Actions | Time | Comments | Position Change | Time |
|---|------|----------|-----------------|------|
| Stop pushing | | | | |
| Maternal change of position | | | | |
| Listen through 3 consecutive contractions | | | | |

| | | | | |
|---|--------|-------|--|------|
| 6 minutes – Say 'We are at 6 minutes the FH is _____' | | | | Time |
| BP | Normal | Low | VE to exclude cord, abruption, rupture | |
| Abdomen | Soft | Rigid | | |
| | No | N/A | Informed theatre | |
| PVB | No | Yes | Put out '2222' call | |

| | |
|---|-------------------------------------|
| 9 minutes – Say 'We are at 9 minutes and the FH is _____' | Time entered theatre if transferred |
|---|-------------------------------------|

| Preparation for Delivery | | | |
|--------------------------------------|------|------------------------------|------|
| Action | Time | Action | Time |
| Perineum infiltration/pudendal block | | Preparation for instrumental | |
| Episiotomy | | Decision for EMCS | |

| | | | | | |
|---|------|--------------|------|------|--------------|
| Attendance | | | | | |
| Name | Role | Time arrived | Name | Role | Time arrived |
| | | | | | |
| | | | | | |
| | | | | | |
| Additional Comments/Plan for ongoing care | | | | | |
| | | | | | |

Don't forget cord gases.

| | |
|-------------------------|--|
| Time FH recovered to BL | |
|-------------------------|--|

Please scan into Badgernet