Frimley Health
NHS Foundation Trust

Intrapartum Fetal Heart Monitoring Guideline

Key Points

- Fetal heart rate monitoring is a tool to provide guidance on fetal condition, and not a standalone diagnostic tool
- The findings from monitoring need to be looked at together with the developing clinical picture for both woman and baby

Version: 4.0
Date Issued: 8 April 2024
Review Date: March 2027
Key words: CTG, FBS, fresh eyes, auscultation, FH, FHR, fetal heart, telemetry

Abbreviations

CTG	Cardiotocography
EFM	Electronic fetal monitoring
FBS	Fetal blood sampling
FHR	Fetal Heart Rate
FIGO	Federation of Gynaecology and Obstetrics
FSE	Fetal scalp electrode
IA	Intelligent Auscultation
IOL	Induction of labour
LMWH	Low molecular weight heparin
NICE	National Institute for Clinical Excellence
PCA	Patient controlled analgesia

Contents

1. Introduction - Purpose of the Guideline 3
2. Initial Assessment During Labour and Methods for Fetal Monitoring 3
3. Intermittent Auscultation 3
3.1 Introduction and criteria for intelligent intermittent auscultation: 4
3.2 Risk Assessment 4
3.3 Intermittent auscultation for low risk women 5
3.5 Escalation 6
4. Continuous Cardiotocography 6
4.1 Indications for Continuous Intrapartum Electronic Fetal Monitoring (EFM) 6
4.3 Telemetry 7
4.4 When cardiotocography is declined 8
5 CTG monitoring and Record-Keeping 8
5.1 In order to ensure accurate record-keeping 8
5.2 Fresh Eyes Approach to CTG Categorisation – Buddy System 9
6 Evaluation of Basic CTG Features 10
7. Management based on physiology CTG interpretation 13
7.1 Other causes of abnormal CTG: 17
8. Management of prolonged deceleration and /or fetal bradycardia 17
9. Fetal monitoring during and after insertion of an Epidural Block 18
10. Fetal Blood Sampling (FBS) 18
11. Cord Blood Sampling and placental histology 18
12 Auditable Standards 19
13. Monitoring compliance 20
14. References 21
Full version control record 23

1. INTRODUCTION - PURPOSE OF THE GUIDELINE

1.1 This guideline is based on the International Federation of Gynaecology and Obstetrics (FIGO) consensus guideline on intrapartum fetal monitoring (2015)[1] with practice recommendations from NICE guideline (NG229) *Fetal Monitoring in Labour (2022)*[2]

1.2 The aim of intrapartum fetal monitoring is to identify fetal hypoxia developing during labour. Use the advice in this guideline to interpret and categorise intrapartum CTG traces, but when interpreting how the baby is coping with labour take into account maternal, fetal and labour factors as well as CTG changes.

1.3 Decisions about a woman's care should not be based on cardiotocography (CTG) findings alone.

1.4 It is essential that clear, concise and consistent information is given to the woman prior to the commencement of fetal monitoring, taking into account the woman's wishes and appropriate method given her obstetric history. This should be clearly documented in the maternity notes.

2. INITIAL ASSESSMENT DURING LABOUR AND METHODS FOR FETAL MONITORING

2.1 Perform an initial assessment of antenatal risk factors for fetal compromise at the onset of labour to determine whether intermittent auscultation or cardiotocography (CTG) is offered as the initial method of fetal heart rate monitoring.
Take into account the recommendations for fetal monitoring for women who are considered to be at higher risk of complications during labour because of existing medical conditions or obstetric complications (see the NICE guideline on intrapartum care for women with existing medical conditions or obstetric complications and their babies)[3] or for women with multiple pregnancies (see the section on fetal monitoring during labour in twin pregnancy in the NICE guideline on twin and triplet pregnancy)[4].

2.2 Explain to the woman that risk assessment is a continual process, and the advised method of fetal heart rate monitoring may change throughout the course of labour.

2.3 Explain to women that if there are no risk factors for fetal compromise identified, there is a risk of increased interventions with continuous CTG monitoring compared with intermittent auscultation, which may outweigh the benefits and advice provided by her midwife or obstetrician on the method of fetal heart rate monitoring will consider the whole clinical picture.

3. INTERMITTENT AUSCULTATION

This section should be read in conjunction with the Care of women in Labour guidelines.

3.1 Introduction and criteria for intelligent intermittent auscultation:

The practice has been termed ‘intelligent auscultation’ to highlight the extension beyond listening for the presence of the fetal heart, but requires an understanding of fetal physiology as well as the intrapartum hypoxic process and how this may influence the features of the fetal heart rate (FHR) (Chandraharan, et al. 2017).

The aim is to detect deviations from the norm that may suggest possible fetal compromise, or identify a fetus requiring a more intensive assessment (Lewis and Downe, 2015)

For women with no risk factors for fetal hypoxia, IA is the recommended method for intrapartum fetal monitoring; this is regardless of the birth setting. Continuous electronic fetal monitoring (EFM) should not form part of a routine labour care for women.

Intermittent auscultation permits the fetal heart to be monitored in various positions and locations and favours the mobility of laboring women, which has been shown to benefit the progress of labour

A woman must be fully informed of the risks and benefit of IIA and CEFM. If during labour she chooses not to be monitored by the recommended method a full discussion should take place and the labour ward coordinator and senior obstetrician informed.

3.2 Risk Assessment

All women that have existing medical or obstetric conditions should have an obstetric review during pregnancy with a full plan of care formulated for labour and birth. This should include the type of fetal monitoring required when in labour. The care plan should be discussed and agreed by the woman.

At the onset of labour, a structured initial labour risk assessment should be completed and documented on electronic patient record (EPR). This will include recommendation of the most appropriate fetal monitoring method and place of birth at the start of labour.

This risk assessment should be revisited throughout labour as part of a holistic review. Regular systematic review of maternal and fetal wellbeing should be agreed and implemented.

This should be re-evaluated and discussed with a second member of staff at least 4 hourly when undertaking IA and should lead to escalation if indicated. (Saving babies’ lives V3, 2023)

3.3 Intermittent auscultation for low risk women

Latent phase

It is recommended that women endeavor to spend the latent stage of labour in their own home, thereby facilitating the most efficient and comfortable transition into established labour. If a plan of care has been made with the woman to remain in hospital during the latent phase of labour, then the fetal heart should be auscultated at least every six hours if the woman is experiencing contractions. Any woman who is experiencing contractions and requires increased analgesia should have a full reassessment of her labour progress and fetal heart auscultation and/or EFM should be commenced (according to the existing risk factors).

Established labour

It is important to remain alert to possible transitions between different phases of labour and adjust frequency of monitoring accordingly. After the initial assessment has been completed and established labour has been confirmed, regular auscultation should begin:

- Do not perform a CTG on admission for low-risk women in suspected or established labour in any birthing setting as part of an initial assessment.
- The fetal heart rate (FHR) should be auscultated with a Pinard stethoscope or hand-held Doppler to determine the baseline rate. This is achieved by auscultating immediately after a palpated contraction for at least one minute.
- Auscultation should occur at least:
    - every 15 minutes in the first stage immediately after a contraction for a minimum of 1 minute
    - every 5 minutes or after every other contraction in the second stage
- Maternal pulse should be assessed and recorded when first monitoring the fetal heart to distinguish between the two.
- Each auscultation of the fetal heart must be plotted on EPR as a single rate.
- Record accelerations and decelerations if heard.
- Palpate the maternal pulse when FHR is auscultated and record on EPR. Rapid recourse to confirmation with ultrasound or fetal scalp electrode (FSE) is required if there is uncertainty as to whether maternal or fetal heart rate is being monitored. (Each baby counts).

3.4 Escalation

When there is a concern regarding fetal wellbeing, or overall suitability to remain in the current birth setting, immediate help should be sought. Concerns should be escalated to the Labour Ward Coordinator and/or a paramedic ambulance via 999.

In the event of a rise in baseline, a deceleration or a persistent acceleration being auscultated, the following actions must be taken:

- Carry our intermittent auscultation more frequently, for example immediately after the next three consecutive contractions (NICE 2022)
- Carry out a full review, taking into account the whole clinical picture including antenatal and existing or new intrapartum risk factors, maternal observations, contraction frequency and the progress of labour (NICE 2022)
- Recommend immediate continuous EFM if intermittent auscultation indicates possible fetal heart rate abnormalities and explain to the woman why this is being offered. Remove the cardiotocograph if the trace is normal after 20 minutes and return to intermittent auscultation.

4. CONTINUOUS CARDIOTOCOGRAPHY

4.1 Indications for Continuous Intrapartum Electronic Fetal Monitoring (EFM)

Advise continuous EFM if any of the risk factors below are identified:

Maternal risk factors

- Previous caesarean birth or other full thickness uterine scar
- Any hypertensive disorder needing medications
- Prolonged rupture of membranes (>/=24 hours) before the onset of established lab our
- Antepartum haemorrhage
- Suspected chorioamnionitis or maternal sepsis
- Pre-existing diabetes (type 1 or type 2) and gestational diabetes requiring medication
- Other significant maternal medical disease
- Woman’s request

Fetal risk factors

- Non cephalic presentation (including breech, transverse, oblique or cord)
- Fetal growth restriction (EFW<3rd centile)
- Small for gestational age (EFM<10th centile) with other high risk features such as abnormal doppler scan result, reduced liquor volume or reduced growth velocity
- Pre-term baby
- Advanced gestational age more than 42 weeks
- Anhydraminos/polyhydramnios
- Reduced fetal movements in the 24h preceding the onset of regular contractions
- Multiple pregnancy (all babies to be monitored)
- Haemolytic disease of the fetus

- Offer continuous CTG monitoring for women who have or develop any of the following new ***intrapartum risk factors*****:**

- Presence of meconium
- Insertion of regional analgesia (for example, epidural)
- Use of oxytocin
- Contractions that last longer than 2 minutes, or 5 or more contractions in 10 min
- Suspected chorioamnionitis or sepsis
- Fresh vaginal bleeding that develops in labour
- Blood stained liquor not associated with vaginal examination
- Pain reported by woman that differs from the pain normally associated with contractions
- Maternal pulse over 120 bpm on two occasions 30 minutes apart
- Maternal pyrexia (a temperature of 38^{O}C or above on a single reading or 37.5^{O}C on two consecutive occasions 1 hour apart)
- Severe hypertension (a single reading of either systolic blood pressure of 160 mmHg or more or diastolic blood pressure of 110mmHg or more, measured between contractions)
- Hypertension (either systolic blood pressure of 140 mmHg or more or diastolic blood pressure of 90 mmHg or more on 2 consecutive readings taken 30 minutes apart, measured between contractions)
- 2+ proteinuria and a single reading or either systolic blood pressure of 140 mmHg or more or diastolic blood pressure of 90 mmHg or more
- Confirmed delay in the first or the second stage of labour
- Abnormalities on the fetal heart rate detected on intermittent auscultation:
    - Less than 110 or above 160 bpm
    - deceleration in fetal heart rate
    - change in baseline of more than 20bpm

Do not regard amniotomy alone for suspected delay in the established first stage of labour as an indication to start continuous CTG.

4.2 A fetal scalp electrode (FSE)

should be applied with the woman's consent when there is inadequate abdominal recording.

Avoid FSE with:

- HIV, hepatitis B and C
- Bleeding disorders
- Prematurity less than 34 weeks gestation

An FSE is not a treatment for an abnormal trace.

4.3 **Telemetry**

Consider telemetry, for any woman who needs continuous CTG during labour who wishes to remain mobile or whilst using the pool (see Use of the Pool During Labour and Birth guideline).

4.4 When cardiotocography is declined

If continuous fetal monitoring is advised but declined, explain to the woman her birth companion(s) why it is recommended at the implications of type and place of care.

Explain that continuous cardiotocography is used to monitor the baby's heartbeat and the labour contractions.

Explain to the woman that the CTG can provide signs of developing fetal compromise and the need to take further action.

Explain that decision about whether to take any further action will be based on an assessment of several factors, including the findings from CTG.

Documentation should include all advice given.

5 CTG MONITORING AND RECORD-KEEPING

5.1 In order to ensure accurate record-keeping

- Record all relevant documentation as per electronic patient record (EPR)
- The date and time on the CTG machine should be correctly set.
- The paper should be specific for the machine in use, with correct orientation.
- All CTG traces should be linked to Mosos central monitoring system, this allows simultaneous monitoring of multiple traces in one or more locations.
- Mosos central monitoring is an additional resource and therefore should not be used to replace the bedside "fresh eyes" systematic review.
- The woman should be connected to the Mosos system to ensure electronic storage of the CTG and dis-connected after the CTG trace has been discontinued.
- CTG traces should be labelled with the mother's name, date of birth, date, time, MRN or NHS number and indication for EFM.
- Ideal practice is for the midwife to listen with a Pinard to locate the fetal heart prior to commencing the CTG.
- The woman's pulse should be recorded at the start of the CTG and at least every 60 minutes in the first stage of labour or more frequently if there is cause for concern e.g. prolonged fetal deceleration or loss of contact on CTG. In the second stage of labour the maternal pulse should be recorded at least every 15 minutes and recorded on electronic patient records (EPR).
- If monitoring of the contractions is not possible, the trace should be marked to denote their occurrence

- Any intrapartum events that may affect the FHR should be noted at the time on the FHR trace. For example, vaginal examination, FBS, siting of an epidural, medication, etc.

- Any member of staff who is asked to provide an opinion on a trace should note their findings using a fresh-eyes approach.

- Women in theatre for an elective caesarean section should have intermittent auscultation performed following insertion of the spinal, whilst waiting for an effective block.

- Women going to theatre for an emergency caesarean section must have continuous EFM in theatre until the operation commences.

- At completion of the tracing, the healthcare professional should sign and note the date, time and mode of birth, if applicable, on the CTG and document it has been discontinued. The woman should also be disconnected from Mosos.

- The CTG traces should be numbered in chronological order and stored within a brown CTG envelope within the maternity records.

- Cord gases are recorded on EPIC system

- Ensure all traces are registered on Mosos to allow them to be stored electronically.

5.2 Fresh Eyes Approach to CTG Categorisation – Buddy System

- The CTG should be systematically reviewed using the 'Fresh Eyes' approach, at least hourly by two qualified professionals, and include an objective holistic review taking into account antenatal and intrapartum risk factors, in conjunction with interpretation of the CTG trace.

- The FIGO CTG classification will be used to determine if a CTG shows evidence of hypoxia or another pathology (appendix 1).

- If assessed by a doctor, they must be at least ST2 level; and if assessed by 2 midwives, 1 must be at least a band 6 midwife or above.

- The Trust uses a CTG tool on electronic patient record (EPR) that is based on FIGO classification; this should be completed at least every hour and the fresh eyes buddy should independently assess the categorisation.

- The agreed categorisation should be signed, dated and timed. Also, the categorisation should be noted on the CTG trace and signed by both professionals.

- If staff are unable to agree the CTG categorisation at time of review, the CTG should still unable to agree a plan of care due to disputed CTG categorisation, an escalation to the consultant of the week (COW), the labour ward lead or any other consultant is required. All midwives can refer directly to the consultant if not in agreement with the advice they are given about the CTG interpretation or labour management through the usual referral system.

6 EVALUATION OF BASIC CTG FEATURES

CTG analysis starts with the evaluation of basic CTG features (**baseline, variability, accelerations, decelerations, and contractions**) followed by overall CTG classification.

When reviewing CTG traces:

- evaluate changes on traces over time to ascertain changes in the baby's condition
- document any changes in the CTG trace from the previous review
- review the changes alongside any existing and new intrapartum risk factors
- think about the possible reasons for any changes, and take these and the whole clinical picture into account when planning ongoing care
- Obtain an in-person review of every hourly assessment by another clinician ("fresh eyes") for women on CTG, to be completed before the next assessment takes place.

Positive features

Evidence of cycling of variability, accelerations and positive fetal response to scalp stimulation all denote a healthy response by the fetus

Fetal Heart Rate (FHR) Baseline

The mean fetal heart rate, excluding accelerations or decelerations, over a period of 10 minutes, when the fetal heart rate is stable.

Preterm fetuses often display values towards the upper end of the scale and post-term fetuses towards the lower end.

> **Rising Baseline**: When deciding if there is any change of baseline fetal heart rate, compare it with earlier CTG-s or recordings of fetal heart rate. An increase in baseline heart rate by more than 10% (or 20 bpm) over an hour can represent either developing infection or hypoxia.
>
> **Tachycardia:** a baseline rate above 160 bpm for more than 10 minutes.
>
> **Bradycardia:** a baseline rate below 110 lasting more than 10 minutes. Baseline rate of 100 – 110 may occur in normal foetuses especially if postdates,

Variability

Fluctuations in the fetal heart rate (FHR) baseline that are irregular in amplitude and frequency. This can be assessed by selecting a one-minute segment of trace, without accelerations or decelerations and measuring the difference between the highest and lowest rate. The difference is the amplitude of variability.

> **Normal variability**: a bandwidth amplitude of 5−25 bpm.
>
> **Reduced variability**: a bandwidth amplitude below 5 bpm for more than 50 minutes in baseline segments, or for more than 3 minutes during decelerations. Reduced variability can occur due to central nervous system hypoxia/acidosis and resulting decreased sympathetic and parasympathetic activity. It can also be due to previous cerebral injury, infection, administration of central nervous system depressants or parasympathetic blockers. During deep sleep, variability is usually in the lower range

of normality, but the bandwidth amplitude is seldom under 5 bpm. There is a high degree of subjectivity in the visual evaluation of this parameter, and therefore careful re-evaluation is recommended in borderline situations.

Following an initially normal CTG, reduced variability due to hypoxia is very unlikely to occur during labour without preceding or concomitant decelerations and a rise in the baseline.

Increased variability (saltatory pattern): a bandwidth value exceeding 25 bpm lasting more than 30 minutes. Saltatory pattern may occur in rapidly evolving hypoxia, especially in second stage of labour with active maternal pushing.

Accelerations

Define accelerations as transient increases in fetal heart rate of 15 beats a minute or more, lasting 15 seconds or more. Accelerations lasting 10 mins or more are considered a baseline change.
In pregnancies <32 weeks gestations, accelerations may be an increase of 10 bpm or more above baseline which lasts 10 seconds or more.
Lack of accelerations for more than 50 minutes in antenatal women is considered a non – reassuring feature. The absence of accelerations in an otherwise normal intrapartum CTG is of uncertain significance but is unlikely to indicate hypoxia/acidosis.
Persistent accelerations coinciding with uterine contractions in the second stage of labour may indicate that the maternal heart rate is being recorded as fetal accelerations are unlikely to occur.

Decelerations

A drop in the fetal heart rate of more than 15 beats, lasting for more than 15 seconds. An exception to this is that in a trace with reduced variability, decelerations may be 'shallow'.

Decelerations are considered to be a reflex response to protect the myocardial workload when a fetus is exposed to a *hypoxic or a mechanical stress*, to help maintain an aerobic metabolism within the myocardium.

There are two types of decelerations based on the mechanism of fetal response to mechanical or hypoxic stress: **Baroreceptor decelerations** (baroreceptor-mediated response to either head or cord compression) and **Chemoreceptor decelerations** (chemoreceptor-mediated response to fetal hypoxemia/acidosis). Early and variable decelerations are baroreceptor decelerations. Late decelerations are chemoreceptor decelerations.

Early decelerations: shallow, short-lasting with normal variability within the deceleration and coincide with the contractions. They are caused by head compression in the late first and second stage of labour and do not indicate fetal hypoxia/acidosis.

Variable Decelerations (V-shaped): V-shaped decelerations that exhibit a rapid drop (onset to nadir in < 30s) followed by a rapid recovery to the baseline. They vary in shape, size and relationship to the uterine contractions. These decelerations are

indicative of a baroreceptor-mediated response to stress and are associated with gradually evolving fetal hypoxia.

Late Decelerations: (U-shaped and / or with reduced variability): gradual onset and/or a gradual return to the baseline and/or reduced or increased variability within the deceleration. Gradual onset and return occurs when more than 30s elapses between the beginning/end of a deceleration and its nadir. Late decelerations start more than 20s after the onset of contraction, have a nadir after the acme, and a return to the baseline after the end of the contraction. These decelerations are indicative of a chemoreceptor-mediated response to fetal hypoxemia/acidosis.

Repetitive Decelerations: occur with more than 50% of contractions.

Prolonged Deceleration: a decrease in fetal heart rate below the baseline lasting more than 3 mins. These are likely to include a chemoreceptor-mediated component and thus to indicate hypoxemia. Decelerations exceeding 5 min with fetal heart rate maintained at less than 80 bpm and reduced variability within the deceleration are frequently associated with acute fetal hypoxia / acidosis and require immediate intervention.

Sinusoidal Pattern

A regular, smooth, undulating signal, resembling a sine wave, with an amplitude of 5-15bpm, and a frequency cycle of 3-5 cycles per minute. This pattern lasts more than 30 minutes and coincides with absent accelerations. Sinusoidal pattern is believed to occur secondary to acute fetal hypotension and resultant acute hypoxia to the central nervous system that causes instability of the autonomic nervous system.

Pseudosinusoidal Pattern

Pattern resembling the sinusoidal pattern but with more jagged “saw-tooth” appearance rather than the smooth sine-wave form. Its duration seldom exceeds 30 min and it’s characterised by normal patterns before and afterwards. Pseudosinusoidal is not typically associated with fetal compromise.

Contractions

45 - 120 second duration, up to 5 in 10 minutes, but resting tone of the uterus in-between contractions is significant

Tachysystole: referring to the presence of more than 5 contractions in 10 minutes in the absence of changes in the FHR.

Uterine Hyperstimulation: referring to the presence of more than 5 contractions in 10 minutes with changes in the FHR.

Hypertonia / Uterine Hypertonus: referring to a sustained uterine contraction lasting >120 seconds and has the potential to cause a prolonged deceleration

7. MANAGEMENT BASED ON PHYSIOLOGY CTG INTERPRETATION

Any CTG that is suggestive of either fetal hypoxia or other underlying fetal problem should be referred to the midwife co-ordinator or the obstetric team.

Refer to the following table showing management of various CTG patterns.

Hypoxia	Features	Management
No fetal hypoxia	• Baseline appropriate for gestational age • Normal variability and cycling • No repetitive decelerations	• Consider whether the CTG needs to continue (if started because of concerns arising from intermittent auscultation) • If continuing the CTG perform routine hourly review
Chronic Hypoxia	• Higher baseline than expected for gestational age • Reduced variability and/or absence of cycling • Absence of accelerations • Shallow decelerations • Consider the clinical indicators: reduced fetal movements, thick meconium, bleeding, evidence of chorioamnionitis, postmaturity, IUGR	• Urgent escalation • Avoid further stress • Expedite delivery if delivery not imminent
Gradually Evolving Hypoxia (compensated)	• Stable baseline (with normal variability), repetitive variable or late decelerations, lack of accelerations • Rise in baseline >10% (with normal variability and stable baseline) preceded by decelerations and loss of accelerations	• Urgent Escalation to the Midwife Coordinator and the Obstetric Team • Likely to respond to conservative interventions: adopt a left-lateral position, avoid supine position • Consider intravenous fluids • Reduce contraction frequency: remove prostaglandins; stop oxytocin infusion; if no improvement needs tocolysis • Regular review every 30-60 min to assess for signs of further hypoxic change; ensure that the interventions resulted in improvement • Other causes such as reduced placental reserve MUST be considered and addressed accordingly.
Gradually Evolving Hypoxia (de compensated)	• Rise in baseline >10 % • Reduced or increased variability • Unstable/progressive decline in the baseline (step ladder pattern to death)	• Immediate escalation to the Midwife Coordinator and the Obstetric Team • 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 by 15 min.

Subacute Hypoxia	• More time spent during decelerations than at the baseline • Can be associated with salutatory pattern (increased variability)	• Immediate escalation to the Midwife Coordinator and the Obstetric Team • <u>First stage</u> Remove prostaglandin pessary/ stop oxytocin infusion If no improvement, needs urgent tocolysis If still no evidence of improvement within 10-15 min, review situation and expedite delivery • <u>Second stage</u> Stop maternal active pushing during contractions until improvement is noted If no improvement is noted, consider tocolysis if delivery is not imminent or expedite delivery by operative vaginal delivery pH drop of 0.01/ 2-3 min
Acute Hypoxia	• Prolonged deceleration (>3 minutes)	• Immediate escalation • Preceded by reduced variability and lack of cycling or reduced variability within the first 3 minutes: Immediate delivery by the safest and quickest route • Preceded by normal variability and cycling and normal variability during the first 3 minutes of the deceleration: Exclude the 3 irreversible causes of acute hypoxia (cord prolapse, placental abruption or uterine rupture). If any of those is suspected, deliver immediately by the quickest and safest possible way. Immediate action is required to correct reversible causes of fetal hypoxia (cord compression, uterine hyper stimulation or maternal hypotension) in order to improve the fetal oxygenation. Remove prostaglandins, stop oxytocin, give tocolitics, administer iv fluids. If no improvement by 9 minutes or any of the irreversible causes diagnosed, immediate delivery by the safest and the quickest route • pH drop of 0.01/min

Other diagnoses with negative CTG features		
Sepsis	• Increase in the baseline fetal heart rate with more than 10% usually not preceded by decelerations, reduced variability, decelerations may be absent	• Escalate to senior team • Start iv fluids and the septic bundle. If no improvement after fluid challenge and administration of antibiotics, expedite delivery.
Feto-maternal haemorrhage/ Fetal anaemia Bleeding vasa-praevia	• Sinusoidal CTG	• If sinusoidal CTG features are persistent for more than 30 minutes or cannot be interrupted by digital fetal scalp stimulation, consider immediate delivery
Unable to ascertain fetal wellbeing due to: Poor signal quality Uncertain baseline Possible recording of the maternal heart rate		• Escalate to senior team • Consider the application of FSE to improve signal quality • Consider adjunctive techniques, if appropriate (ultrasound for detection of fetal cardiac activity)

7.1 Other causes of abnormal CTG

- Medications (pethidine, remifentanil PCA)
- Chromosomal/congenital abnormality
- Cerebral haemorrhage

8. MANAGEMENT OF PROLONGED DECELERATION AND / OR FETAL BRADYCARDIA

Fetal bradycardia is defined as a baseline fetal heart less than 110 bpm for more than 10 minutes. Values between 100 and 110 bpm may occur in normal fetuses, especially in postdate fetuses.

In the absence of cord prolapse, uterine rupture or placental abruption, 90% of CTGs will recover in 6 minutes and 95% in 9 minutes.
The most common causes of prolonged deceleration are excessive uterine activity (hyperstimulation), cord compression and maternal hypotension. It can be usually reversed by stopping the oxytocin infusion, removing the prostaglandins if possible and /or starting acute tocolysis with beta-adrenergic agonists (terbutaline).
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 is reversed.

The "3, 6, 9, 12, 15 minute rule" is based on this observation.[9]

By 3 minutes – change maternal position to left lateral, give IV fluids, stop oxytocin, consider tocolysis with 0.25mg Terbutaline subcutaneously, call the emergency buzzer

By 6 minutes – obstetric registrar should be present for further assessment, determine if vaginal delivery is imminent and if not, prepare to move to theatre

By 9 minutes – be in theatre / or preparing for instrumental delivery

By 12 minutes – commence delivery

By 15 minutes – have achieved birth

If the fetal heart shows signs of recovery during preparation for delivery, it is appropriate to wait and observe, but vigilance must be maintained.

Good baseline variability during the first 3 minutes of the prolonged deceleration and / or recovery of the FHR is reassuring. Normal CTG before the prolonged deceleration indicates good prognosis for recovery.

If irreversible causes of acute hypoxia are suspected (uterine rupture, cord prolapse or placental abruption), the rule above should not be used and delivery should be expedited by the quickest and safest possible way.

Do not use maternal facial oxygen therapy for intrauterine fetal resuscitation, because it may harm the baby (but it can be used where it is administered for maternal indications such as hypoxia or as part of pre oxygenation before a potential anaesthetic).

9. FETAL MONITORING DURING AND AFTER INSERTION OF AN EPIDURAL BLOCK

All efforts should be made to continuously monitor the fetal heart during this procedure. Discussions with the woman and her companion during this period should be documented in the maternal notes.

- In low risk women, continuous EFM should be undertaken during epidural siting, for 30 minutes after insertion of an epidural block and after each anesthetist administered top up. If the CTG is reassuring, it can then be removed and intermittent auscultation used.
- If at any time during the procedure the midwife is concerned about the fetal heart she should request the anaesthetist to stop the procedure and request senior midwifery and/or medical assistance.
- If this is not possible with the abdominal transducers, then a fetal scalp electrode should be applied
- If application of a fetal scalp electrode is not possible or contraindicated, then the fetal heart must be auscultated every 5 minutes or after each contraction

10. FETAL BLOOD SAMPLING (FBS)

The use of fetal blood sampling is not recommended as there is no evidence that its use improves long-term neurological outcomes for the babies or reduces interventions in labour (caesarean sections or instrumental deliveries). It can also cause a delay in accomplishing delivery leading to poor perinatal outcome.

11. CORD BLOOD SAMPLING AND PLACENTAL HISTOLOGY

11.1 Paired umbilical cord blood samples should be taken in the following circumstances:

- Category 1 and 2 caesarean sections
- All operative vaginal deliveries.
- Any baby that has needed fetal blood sampling or has had severe fetal distress during labour.
- Shoulder dystocia.
- All breech or malpresentation deliveries including elective caesarean section for breech presentation
- All preterm deliveries
- Where meconium-stained liquor is present.
- Any baby that is born in poor condition or requiring unexpected admission to NNU

11.2 **Normal Values for paired umbilical Cord Blood Gases at Delivery[5,6]**

	pH	pO_2	pCO_2	Base Excess
Mean arterial	7.1 - 7.38	0.5 – 4.2	5.2 – 9.8	-9.0 - 1.8
Mean venous	7.20-7.44	4.1 – 7.6	1.9 – 5.8	-7.7 - 1.9

11.3 **Placental histology**

The following conditions are indications for referral of placentas for pathological examination[7]

- Baby born in unexpectedly poor condition and admitted to NNU (who require invasive ventilation/neonatal cooling)
- All Baby/ babies born before 32+0
- Severe IUGR/ FGR 3rd centile and below
- Monochrocionic twins
- Maternal Pyrexia >38
- Suspicious placenta or abnormal placentation
- Miscarriage between 16-23+6w/ Still birth/ NND

12 AUDITABLE STANDARDS

12.1 Fetal Monitoring

- Initial and/or ongoing risk assessment should be completed on EPR
- The maternal pulse was palpated to differentiate it from the FHR on admission
- When the fetal heart was auscultated in the first and second stage of labour
- The appropriate transfer from intermittent auscultation to continuous electronic fetal monitoring.
- Documentation of all of the above.

12.2 **IIA**

- Documentation of all the above
- IA is the most appropriate method of FHR monitoring for this mother and baby
- FHR recorded as a single rate
- Documentation of change from IA to EFM

12.3 **CTG traces**

Minimum data to be recorded on tracing:

- Woman's name and hospital number
- Date and time
- Maternal pulse
- Any intrapartum events, that should have been recorded at time of event
- The requirement for those who provide an opinion on the tracing during labour to record this on the trace as well as in the health records
- Data to be included at the completion of the trace
- That continuous monitoring has been in line with the "indication for continuous monitoring" in labour
- That there has been an hourly systematic assessment of the trace by two healthcare professionals to include:
    - Risk assessment
    - Baseline rate
    - Variability
    - Accelerations
    - Decelerations
    - Contractions

- That appropriate actions were undertaken if hypoxia or other concerns have been identified.
- Training has been delivered as described in the TNA

12.3 Cord pH sampling

- When paired blood samples are documented on EPIC system.

13. MONITORING COMPLIANCE

- A retrospective annual audit of maternity notes will be undertaken, taking at least 1% of the total births for the year up to the audit. Results from the annual audit will be presented at the obstetric clinical governance meeting (WPH) and the audit meeting (FPH). Where any issues / non-compliance have been identified, an action plan will be developed to address this. All action plans will be monitored at the cross site obstetrics and gynaecology clinical governance meeting. The audit midwife is responsible for coordinating the audit.
- Records of fetal monitoring are reviewed.
- Adherence to the fetal monitoring guideline is reviewed as part of case review in the multidisciplinary maternity clinical risk meeting

14. REFERENCES

1. Chandraharan, E. 2017: Handbook of CTG Interpretation. Cambridge University Press

2. Lewis D, Downe S (2015) FIGO consensus guidelines on intrapartum fetal monitoring: IA International Journal of Gynaecology and Obstetrics 131 9-12

3. Diogo Ayres-de-Campos, Catherine Y. Spong, Edwin Chandraharan for the FIGO Intrapartum Fetal Monitoring Expert Consensus Panel,2015, FIGO consensus guidelines on intrapartum fetal monitoring: Cardiotocography† Available to view: FIGO Intrapartum Fetal Monitoring Guidelines | Figo

4. National Institute for Health and Care Excellence (NICE) 2014, Updated December 2022 NG 229 Fetal Monitoring in Labour Fetal monitoring in labour (nice.org.uk)

5. Intrapartum care for women with existing medical conditions or obstetric complications and their babies

6. NICE guideline [NG121]Published: 06 March 2019 Last updated: 25 April 2019. Recommendations | Intrapartum care for women with existing medical conditions or obstetric complications and their babies | Guidance | NICE

7. Twin and triplet pregnancy: NICE guideline [NG137]Published: 04 September 2019 Recommendations | Twin and triplet pregnancy | Guidance | NICE

8. Westgate J, Garibaldi JM, Greene KR. (1994) Umbilical cord blood gas analysis at delivery: a time for quality data. Br J Obstet Gynaecol 101 (12): 1054-63

9. Eskes TK, Jongsma HW, Houx PC. (1983) Percentiles for gas values in human umbilical cord blood. Eur J Obstet GynecolReprod Biol 14 (5):341-6

10. Tissue pathway for histopathological examination of the placenta October 2019 Authors: Dr Clair Evans, Queen Elizabeth University Hospital, Glasgow Dr Phillip Cox, Birmingham Women's and Children's NHS Foundation Trust

11. APPENDIX 1. INTRAPARTUM CTG TOOL

INTRAPARTUM CTG FRESH EYES						Frimley Health NHS Foundation Trust
Date:	Time:	Primary Midwife's name: Role:		Reviewer's name: Role:		
Risk factors:						
Maternal HR:		Initial baseline rate:	Contractions/10min:	Oxytocin Rate:		Liquor Colour:
Baseline rate	110-160bpm Appropriate for gestational age	Stable baseline / Rise in baseline > 10%	Rise in baseline rate > 10% / Unstable baseline	More time spent decelerating than at the baseline		Higher baseline than expected for Gestational age
Variability	5-25bpm Cycling; Digital scalp stimulation response present	5-25 bpm	< 5 or >25bpm (saltatory pattern)	< 5 or >25bpm (saltatory pattern)		<5bpm for >50min Absence of cycling
Decelerations	No repetitive decelerations	Present (repetitive variable or late)	Present (repetitive variable or late)	Present (usually late)	Prolonged deceleration > 3 min	Shallow decelerations
Impression	**No fetal hypoxia**	**Gradually evolving hypoxia (compensated)**	**Gradually evolving hypoxia (decompensated)**	**Subacute hypoxia**	**Acute hypoxia**	**Chronic hypoxia**
Clinical Management	No intervention necessary	Conservative measures; Regular reviews 30-60 min	Immediate escalation; Urgent interventions; Delivery if no improvement by 15 min		Immediate escalation; Correct reversible causes; Delivery if irreversible cause	Immediate escalation; Expedite delivery

Other diagnosis	**Clinical Management**	Agreement in interpretation with colleague: **Yes** **No**: Additional senior review required
Chorioamnionitis (rise in baseline, reduced variability, possible lack of decelerations, maternal tachycardia)	Septic screening; antibiotics; expedite delivery	
Sinusoidal pattern >30 min	Immediate escalation; immediate delivery	
Poor signal quality	Consider application of FSE	

Full version control record

Version:	4.0
Guidelines Lead(s):	Petya Doncheva, Obstetrics and Gynaecology Consultant, WPH
Contributor(s):	Ilaria Guratti, Cross Site Lead Midwife for Fetal Monitoring
Lead Director / Chief of Service:	Anne Deans, CoS for Obstetrics and Gynaecology
Library check completed:	3 April 2023
Professional midwifery advocate:	Amanda Dennett, Labour Ward Sister, FPH
Ratified at:	Cross Site Obstetrics Clinical Governance Meeting 27 March 2024
Date Issued:	8 April 2024
Review Date:	March 2027
Pharmaceutical dosing advice and formulary compliance checked by:	Chido Mukoko, Pharmacist, FPH, 11.01.2024
Key words:	CTG, FBS, fresh eyes, auscultation, FH, FHR, fetal heart, telemetry

This guideline has been registered with the Trust. However, clinical guidelines are guidelines only. The interpretation and application of clinical guidelines will remain the responsibility of the individual clinician. If in doubt, contact a senior colleague or expert. Caution is advised when using guidelines after the review date.

This guideline is for use in Frimley Health NHS Foundation Trust hospitals only. Any use outside this location will not be supported by the Trust and will be at the risk of the individual using it.

Version History

Version	Date	Guideline Lead(s)	Status	Comment
1.0	Aug 2015	Sarah Coxon, Alison Kirkpatrick	Final	New cross site guideline
1.1	Sept 2017	Sarah Coxon	Interim	Addition: Fresh Eyes Approach to CTG Categorisation – Buddy System
2.0	June 2018	Sarah Coxon, Alex Tillett Zoe Jones, Eman Jwarah	Final	Updated guideline in line with FIGO, Approved at cross site meeting 26th of June 2018
3.0	June 2020	Petya Doncheva	Final	Updated and approved at OGCG 22.06.2020
4.0	March 2024	Petya Doncheva	Final	Approved at Cross Site Clinical Governance Meeting, 27/03/2024

Related Documents

Document Type	Document Title
Guideline	Use of the Pool During Labour and Birth
Guideline	Care of Women in Labour