1. Aim/Purpose of this Guideline
This gives guidance to obstetricians and midwives in the use and interpretation of intrapartum cardiotocography (CTG), when to perform fetal blood sampling (FBS) and in what circumstances paired cord samples should be taken.

2. The Guidance

2.1 Definition:

2.1.1 Electronic fetal monitoring (EFM) involves the use of a CTG to record the fetal heart-rate (FHR) for the evaluation of fetal wellbeing in order to detect signs of intrapartum hypoxia. The main objective of intrapartum fetal monitoring is to avoid adverse fetal outcome by instituting timely interventions which avoid intrapartum hypoxic-ischaemic injury. Intrapartum fetal monitoring also provides reassurance of adequate fetal oxygenation which may prevent unnecessary obstetric intervention.

2.1.2 To ensure a timely response, appropriate equipment or facilities must be available to expedite delivery and/or to evaluate fetal oxygenation further (FBS or ST analysis).

2.1.3 Staff providing intrapartum care must be trained and competent. CTG monitoring should never be regarded as a substitute for good clinical observation and judgement, or as a reason to leave a mother unattended.

2.1.4 This Guideline is based on the FIGO Classification on Intrapartum Fetal Monitoring (2015). FIGO guidelines use the same parameters for each of the features seen on a CTG as the NICE guidance and specifically considers the physiology behind the intrapartum fetal heart changes.

2.1.5 Related RCHT Clinical guidelines are: Intermittent Auscultation (June 2019) and Intrapartum fetal ST analysis (June 2019).

2.2 Care of women:
The assessment of fetal wellbeing is only one component of intrapartum care. Due consideration must be given to maternal preference in the light of potential risk factors to both mother and baby.

2.2.1 Women must be able to make informed choices regarding their care or treatment.

2.2.2 Women require the same level of care and support regardless of the mode of monitoring. Ensure that the focus of care remains on the woman rather than the CTG trace.

2.2.3 The fetal heart must be auscultated with a Pinard stethoscope or hand held Doppler prior to commencement of a CTG and Staff using EFM.
should be aware of its limitations and artefacts e.g. recording maternal heart rate.

2.2.4 Prior to any form of fetal monitoring, the maternal pulse must be palpated simultaneously with the fetal heart (FH) auscultation in order to differentiate between maternal and fetal heart rate (FHR). Both maternal pulse rate and fetal heart rate must be recorded. If there is any clinical uncertainty the FHR should be confirmed by independent means, such as ultrasound scan.

2.2.5 Maternal supine recumbent position can result in aorto-caval compression. Prolonged monitoring in this position should be avoided. Offer the use of telemetry if available and appropriate.

2.2.6 Remain with the woman to provide one-to-one support.

2.2.7 External CTG must provide a recording of a quality which allows assessment of the basic features. If an acceptable record cannot be obtained, internal monitoring, with the application of a fetal scalp electrode (FSE), should be commenced after discussion with the woman.

2.2.8 A “wait and see” approach could be harmful. If it is not possible to achieve an interpretable CTG, escalate to Delivery Suite coordinator and to obstetric registrar. An USS may be indicated to guide intrapartum management decisions (New 2019).

2.2.9 Contraindications for FSE are as with fetal blood sampling (see 2.11.1).

2.2.10 If an epidural/spinal is sited a continuous, good quality CTG must be maintained. If at any time during the procedure to site an epidural the midwife is concerned about the fetal heart, the anaesthetist should be requested to stop the procedure. Re-establish good quality continuous CTG and escalate to the Delivery Suite coordinator and/or senior obstetrician. (New 2019)

2.2.11 If accelerations repeatedly coincide with contractions, or if there is a sudden change in the CTG features, ensure that the CTG is not inadvertently recording the maternal pulse.

2.2.12 If fetal death is suspected despite the presence of an apparently recordable FHR, fetal viability should be confirmed with real-time ultrasound assessment.

2.2.13 If a woman declines EFM and is high risk, the risks of not being monitored should be discussed by the midwife in charge and Obstetric Registrar should be informed.
2.2.14 To maintain maternal skin integrity, alter the position of the abdominal Tocograph disc, ultrasound disc and/or STAN leg plate at least every four hours.

2.2.15 On removal of any FSE confirm and document that the metal coil is intact after removal.

2.3. **CTG Record keeping**:

2.3.1 Document the woman’s obstetric history and her wishes before commencing a CTG.

2.3.2 The indication/risk factors for commencing continuous CTG (Section 2.5)

2.3.3 At the start of a paper CTG, enter the woman’s name, date, time, NHS number and hospital number (use patient identification sticker) and legible name, designation and signature of midwife (use printed stamp for clarity). **(New 2019)**

2.3.4 Confirmation that the date and time on the CTG is correctly set with the wall clock and initialled by the midwife.

2.3.5 Confirmation that the monitor is set to run at 1 cm per minute. **(New 2019)**

2.3.6 At the initial set up of electronically stored traces (STAN), document the unique identification number for that trace in the maternal notes (on CTG initial assessment sticker, see appendix 5) and the MOSOS event log. **(New 2019)**. This facilitates data retrieval.

2.3.7 Register the patient to the room space on MOSOS; ensure that network connection is secured. This will enable the CTG to be viewed centrally. The CTG is attached, on completion, to the patient’s electronic maternity record. **(New 2019)**

2.3.8 Maternal pulse at the start of the trace and whenever there is a sudden/significant change in the FHR

2.3.9 FHR should be documented every 15 minutes on the partogram

2.3.10 The contraction strength and frequency palpated for 10 minutes every 30 minutes and recorded on the partogram

2.3.11 Any intrapartum events e.g. vaginal examination, fetal blood sample, siting of an epidural that may affect the FHR should be noted contemporaneously on MOSOS (each staff member is identified with a unique username). With paper CTG traces, the events will be entered on the trace with legible name, signature and designation **(New 2019)**
2.3.12 Any member of staff who is asked to provide an opinion on a trace should note the classification of the CTG and document this on MOSOS, or on a paper CTG trace (New 2018) and in the maternal records. Entries must be timed and clearly identifiable (as above).

2.3.13 At the end of a paper CTG the midwife should document the, date, time and mode of birth and legibly sign the trace.

2.4. Fetal heart monitoring in an uncomplicated pregnancy

2.4.1 Intrapartum Intermittent auscultation is the preferred method for fetal monitoring for low-risk women (refer to RCHT Intermittent Auscultation Clinical guideline).

2.4.2 Current evidence does not support the use of an admission CTG.

2.5. Risk Factors requiring continuous EFM

Any clinical situation where there is a high risk of fetal hypoxia/acidosis.

2.5.1. Maternal Indications for EFM

- Hypertension
- Pre-eclampsia
- Diabetes
- Antepartum Haemorrhage
- Previous Caesarean Section
- Other medical Risk factors: hyperthyroidism, cardiac/renal disease, severe anaemia

2.5.2. Fetal indications for EFM:

- Prematurity
- SGA or macrosomia
- Oligo or polyhydramnios
- Abnormal Umbilical Artery Dopplers
- Rh isoimmunisation
- Multiple Pregnancy
- Breech presentation
- Pre-labour rupture of membranes >24 HRS

2.5.3. Intrapartum Factors requiring EFM:

- Sepsis or Maternal Pyrexia e.g. 38.0 °C once or 37.5 °C on two occasions 2 hours apart
- Maternal Tachycardia
- Hypertension
- IOL with known risk factors
- Augmented labour using oxytocin (CTG not necessary for ARM augmentation in low risk labours)
- Significant Meconium-Stained liquor (MSL)
- Fresh bleeding developing in labour
- Obstetric Emergency: Cord prolapse etc.
- Hypertonic Uterus
- Epidural anaesthesia
- FH abnormality detected on intermittent auscultation

2.6 Woman’s Request
EFM may be provided on maternal request, however, a full discussion should take place with the woman and she should be informed that this may increase the risk of intervention without any proven benefits other than reduction in neonatal seizures and may restrict her mobility.

2.7 Settings on CTG
- The horizontal scale, (Paper speed) is set to 1 cm/min
- The vertical scale displays are set to 20 bpm/cm
- FHR range displays of 50–210 bpm are used.
- Dual channel monitors allow simultaneous monitoring of twin

2.8 Interpretation of CTG trace features

<table>
<thead>
<tr>
<th></th>
<th>NORMAL</th>
<th>SUSPICIOUS</th>
<th>PATHOLOGICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>110 to 160 bpm</td>
<td>Lacking at least one of the normal Characteristics but with no pathological features</td>
<td>&lt; 100 bpm</td>
</tr>
<tr>
<td>Variability</td>
<td>5-25 bpm</td>
<td></td>
<td>Reduced variability for &gt; 50 min, increased variability for &gt;30 min, sinusoidal pattern for &gt; 30 min</td>
</tr>
<tr>
<td>Decelerations</td>
<td>No repetitive decelerations * (Decelerations are repetitive when they occur with more than 50% of uterine contractions)</td>
<td></td>
<td>Repetitive late or prolonged decelerations for &gt; 30 minutes (or &gt;20 minutes if reduced variability); One deceleration &gt; 5 minutes</td>
</tr>
<tr>
<td>INTERPRETATION</td>
<td>No hypoxia/ acidosis</td>
<td>Low probability of hypoxia/ acidosis</td>
<td>High probability of hypoxia/ acidosis</td>
</tr>
<tr>
<td>CLINICAL MANAGEMENT</td>
<td>No intervention necessary to improve fetal oxygenation state</td>
<td>Action to correct reversible causes if identified. Close monitoring or additional methods to evaluate fetal oxygenation.</td>
<td>Immediate action to correct reversible causes. Additional methods to evaluate fetal oxygenation or, if this is not possible, expedite delivery. In acute situations, immediate delivery should be accomplished</td>
</tr>
</tbody>
</table>

FIGO 2015 CTG Classification criteria and Interpretation and recommended management.

2.9 Systematic Assessment:

2.9.1 It is essential to individualise each fetus and to analyse the CTG together with the clinical picture; decisions about a woman’s care in labour are not based on CTG findings alone.
2.9.2 After 20 minutes of CTG and/or at initiation of ST Analysis, complete the “Initial cardiotocography assessment” sticker and place in the contemporaneous maternity record (Appendix 5). A management plan indicating the most appropriate method for intrapartum fetal monitoring is documented (New 2019).

2.9.3 A structured assessment of the CTG involves a review of all the features. (Contractions, Baseline heart rate, Variability, Accelerations, Decelerations)

2.9.4 See Appendix 3 for Definitions of these features.

2.9.5 The individual practitioner providing care to a woman who requires continuous CTG is responsible for continual interpretation and taking appropriate action in the event of any concerns. These concerns must be escalated to the Delivery Suite coordinator and, if appropriate, the Obstetric Registrar.

2.9.6 If it is difficult to categorise the CTG trace, this must be escalated to the Delivery Suite coordinator and a senior Obstetrician. (New 2019)

2.10 Fresh Eyes:

2.10.1 A documented systematic assessment of the fetal and maternal condition, including the CTG, should be undertaken at 90-minute intervals as a minimum, but ideally every 60 minutes.

2.10.2 All persons undertaking the fresh eyes review must be up to date with Intrapartum fetal monitoring mandatory training (New 2019).

2.10.3 The midwife looking after the woman will seek the assistance of a midwife or doctor to systematically review the CTG trace with them. A buddy system for this review is recommended. A preformatted ‘Fresh Eyes’ sticker must be completed (See below) and secured in the maternal records. This now includes two signatures - one by the midwife responsible for the case and one by the CTG assessor. The CTG classification should be recorded on MOSOS or on the paper CTG trace and signed.

2.10.4 If the midwife/obstetrician decide that a further opinion should be sought, further escalation may be evoked. Escalating Concerns for further medical review should be made using SBARD format.

2.10.5 If there is any doubt, or disagreement, about the classification of a CTG, this should be escalated to an obstetrician (or to the consultant obstetrician if the disagreement is with the obstetric registrar) for a management decision (New 2019).
2.10.6 After each CTG classification, if conservative measures are required, they must be performed in a timely manner and documented appropriately. An appropriate action plan should be discussed with the mother and contemporaneously documented in the clinical notes.

<table>
<thead>
<tr>
<th>CTG ASSESSMENT</th>
<th>Machine Number</th>
<th>Correct date and time on CTG monitor? Y</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define Risk:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contraction:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline Rate:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variability:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accelerations:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decelerations:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Late</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single deceleration ≥ 15 mins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAN:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Hypoxia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-acute</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gradually Evolving</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the quality of CTG adequate? Y</td>
<td>N</td>
<td>Plan:</td>
<td></td>
</tr>
<tr>
<td>Coordinator/Obstetrician informed if CTG not normal? Y</td>
<td>N</td>
<td>Name:</td>
<td></td>
</tr>
<tr>
<td>Further escalation? Y</td>
<td>N</td>
<td>Escalated to (name):</td>
<td></td>
</tr>
<tr>
<td>EFIGO: Normal Suspicious Pathological</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAN: Normal Intermediate Abnormal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signature:</td>
<td>Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Preformatted “Fresh Eyes” sticker CHA2573 V2

2.11 Management based on classification:

See Appendix 4 for the description and management of the different types of intrapartum fetal hypoxia (Acute, Gradually Evolving and Sub-acute). Chronic hypoxia must be excluded when a CTG is commenced, this indicates a hypoxic insult has occurred during the antenatal period and the fetus will have reduced capacity to deal with hypoxic/mecchanical stresses of labour.

When intrapartum fetal hypoxia is anticipated or suspected (suspicious and pathological tracings) and action is required to avoid adverse neonatal outcome, the underlying cause can frequently be identified and the situation reversed, with subsequent recovery of adequate fetal oxygenation and return to a normal tracing.

Any deviations from normal must be escalated to the Delivery Suite coordinator and, if appropriate, the obstetric team.

2.11.1 Excessive uterine activity is the most frequent cause of fetal hypoxia/acidosis. It can usually be reversed by reducing or stopping oxytocin infusion, removing administered prostaglandin and/or starting acute tocolysis (terbutaline 250mcg subcuticular).

2.11.2 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. If there is no improvement, delivery should be expedited.
2.11.3 Transient cord compression is a common cause of CTG changes (variable decelerations). These can sometimes be corrected by changing the maternal position.

2.11.4 Sudden maternal hypotension, after epidural or spinal analgesia, is usually reversible by rapid fluid administration and/or an intravenous ephedrine bolus.

2.11.5 Correct aorto-caval compression by turning the woman onto her side; avoid prolonged supine recumbent maternal position.

2.11.6 Other less frequent complications affecting the maternal respiration, maternal circulation, placenta, umbilical cord or the fetal circulation can also result in fetal hypoxia/acidosis.

2.11.7 Oxygen administration to the woman does not improve fetal oxygenation when maternal oxygenation is adequate.

2.11.8 Intravenous fluid administration may not improve fetal oxygenation with hydrated, normotensive women.

2.11.9 When a suspicious or worsening CTG pattern is identified, the underlying cause should be addressed before a pathological tracing develops. If the situation does not revert and the pattern continues to deteriorate, consideration needs to be given for further evaluation, using fetal blood sampling and/or ST-analysis.

2.11.10 In cases of acute fetal compromise, delivery should be accomplished as soon as possible, accounting for the severity of the FHR abnormality and relevant maternal factors.

2.12. Storage of EFM tracings:

2.12.1 EFM traces should be kept for a minimum of 25 years.

2.12.2 All paper traces (New 2019) should be placed in a secure store envelope. The envelope should be hole-punched and filed chronologically in the maternal records.

2.12.3 Tracer systems should ensure that the maternal records, containing the CTG, can always be located.

2.12.4 All traces received to MOSOS will be electronically stored on the hospital server. Two hours after completion of the CTG, it will be sent, as a PDF file, to that patient’s E3 maternity record. (New 2019)

2.12.5 All traces from STAN monitors are stored electronically on the hospital server and do not require printing at the end of a case.
2.13. Fetal Blood Sampling
In cases of suspected fetal acidosis, fetal blood sampling (FBS) should be undertaken (in the absence of technical difficulties or any contraindications). FBS is indicated prior to STAN monitoring in the presence of a pathological CTG.

2.13.1. Contraindications to fetal blood sampling include:
- Maternal infection (e.g. HIV, hepatitis viruses and herpes simplex virus)
- Fetal bleeding disorders (e.g. haemophilia, ITP)
- Prematurity (< 34 weeks).
- Where there is clear evidence of acute fetal compromise, fetal blood sampling should not be undertaken and the baby should be delivered urgently.
- Face or breech presentation
- Immediately after a bradycardia.

2.13.1.1 Full explanation should be given to the woman as to the reasons for the FBS, and the procedure and verbal consent obtained. This discussion should be recorded in the woman’s notes and the results and on-going plan should be documented chronologically in the women’s intrapartum notes.

2.13.1.2 Fetal blood sampling should be undertaken with the mother in the left-lateral position and an aseptic technique should be used.
If the sample cannot be obtained, but scalp stimulation results in a FHR acceleration, decide whether to continue labour/expedite the birth according to clinical circumstances.

2.13.2 Classification of fetal blood sample results

<table>
<thead>
<tr>
<th>Fetal blood sample (FBS) result (pH)</th>
<th>Subsequent action</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 7.25 Normal</td>
<td>FBS should be repeated if the FHR abnormality persists</td>
</tr>
<tr>
<td>7.21–7.24 Borderline</td>
<td>Repeat FBS within 30 minutes or consider deliver if rapid fall since last sample</td>
</tr>
<tr>
<td>≤ 7.20 Abnormal</td>
<td>Delivery indicated</td>
</tr>
</tbody>
</table>

If the FBS is >7.20 and Stan monitoring is available on-going surveillance will be by ST analysis not by repeat FBS

If ST analysis is not available, on-going FBS surveillance should take place as follows:
2.13.2.1 All scalp pH estimations should be interpreted taking into account the initial pH measurement, the rate of progress in labour and the clinical features of the mother and baby.

2.13.2.2 After a normal FBS result, sampling should be repeated no more than 1 hour later if the FHR trace remains abnormal or sooner if there are further abnormalities.

2.13.2.3 After a borderline FBS result, sampling should be repeated no more than 30 minutes later if the FHR trace remains abnormal or sooner if there are further abnormalities.

2.13.2.4 The time taken to take a fetal blood sample needs to be considered when planning repeat samples

2.13.2.5 If the FHR trace remains unchanged and the FBS result is stable after the second test, a third/further sample may be deferred unless additional abnormalities develop on the trace.

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

2.13.2.7 Fetal blood sampling results should be written, chronologically in the notes and printed reports filed in the secure-store envelope.

2.14. Paired cord samples

<table>
<thead>
<tr>
<th>Normal Acid Base Values$^4$</th>
<th>ARTERY</th>
<th>VEIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.05 TO 7.38</td>
<td>7.17 to 7.48</td>
</tr>
<tr>
<td>pCO$_2$ (kPa)</td>
<td>4.9 to 10.7</td>
<td>3.5 to 7.9</td>
</tr>
<tr>
<td>BDdef (mmol/l)</td>
<td>-2.5 to -10</td>
<td>-1.5 to -9</td>
</tr>
</tbody>
</table>

2.14.1 Regardless of the chosen method for intrapartum monitoring, the criteria for obtaining cord samples in the hospital setting are:
- Emergency caesarean sections and instrumental deliveries
- Low Apgar score (<7 at 5 minutes of age) or any baby born in poor condition
- Shoulder dystocia
- Where significant meconium is present
- Delivery following abnormal CTG (New 2019)

2.14.2 Paired cord samples should be taken on all instrumental deliveries, emergency CS and births in which there has been concern regarding fetal wellbeing or admission to neonatal unit is expected

2.14.3 Sampling of the vessels should be done as soon as possible, preferably within 15 minutes of the birth$^1$. 
2.14.4 Umbilical artery reflects the fetal acid-base status better than venous blood.

2.14.5 Sampling of the wrong/same sample is not uncommon. A difference between the two samples of ≥0.02 with the pH and ≥0.7 kPa with the pCO$_2$ indicates two different samples$^1$.

2.14.6 It is the responsibility of the person conducting the delivery, to take the paired cord samples, unless this is not possible, then it may be delegated to another person.

2.14.7 All paired cord sample results should be hand written in the notes and printed reports filed in the secure-store envelope.

### 3. Monitoring compliance and effectiveness

<table>
<thead>
<tr>
<th>Element to be monitored</th>
<th>Tool for monitoring EFM</th>
<th>Frequency of monitoring EFM</th>
<th>Reporting arrangements</th>
<th>Acting on recommendations and Lead(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record keeping by obstetricians and midwives</td>
<td>Is the following data recorded, on the trace when commencing a CTG: Midwife’s signature, woman’s name, date, time and hospital number</td>
<td>Annually - 1% or 10 sets, whichever the greatest, of all health records of women who have had EFM and paired cord sampling</td>
<td>Maternity Patient Safety Forum and Clinical Audit Forum</td>
<td>Any deficiencies identified on the annual report will be discussed at the Maternity Patient Safety or Clinical Audit Forum and an action plan developed</td>
</tr>
<tr>
<td>Audit Midwives</td>
<td>Are Intrapartum events recorded and signed on the trace</td>
<td>Annually - 1% or 10 sets, whichever the greater, of all health records of women where there has been concern about the baby in labour, or immediately following birth, in whom paired cord sampling only has been undertaken</td>
<td>During the process of the audit if compliance is below 75% or other deficiencies identified, this will be highlighted at the next Maternity Patient Safety Forum or Clinical Audit Forum and an action plan agreed.</td>
<td>Action leads will be identified and a time frame for the action to be completed by</td>
</tr>
</tbody>
</table>
| Change in practice and lessons to be shared | • The action plan will be monitored by the Patient Safety Management Forum or Clinical Audit Forum until all actions complete  

|   | • Required changes to practice will be identified and actioned within a time frame agreed on the action plan  
|   | • A lead member of the forum will be identified to take each change forward where appropriate.  
|   | • The results of the audits will be distributed to all staff through the Patient Safety Newsletter and Clinical Audit Forum as per the action plan |

4. Equality and Diversity

4.1 This document complies with the Royal Cornwall Hospitals NHS Trust service Equality and Diversity statement which can be found in the 'Equality, Inclusion & Human Rights Policy' or the Equality and Diversity website.

4.2 **Equality Impact Assessment**

The Initial Equality Impact Assessment Screening Form is at Appendix 2.
### Appendix 1. Governance Information

<table>
<thead>
<tr>
<th>Document Title</th>
<th>Electronic Fetal Monitoring (EFM), Fetal Blood Sampling (FBS) and Paired Cord Sampling Clinical Guideline V4.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Issued/Approved:</td>
<td>November 2019</td>
</tr>
<tr>
<td>Date Valid From:</td>
<td>November 2019</td>
</tr>
<tr>
<td>Date Valid To:</td>
<td>17th June 2022 <em>partial update</em></td>
</tr>
</tbody>
</table>
| Directorate / Department responsible (author/owner): | Obstetrics & Gynaecology Directorate
Sally Budgen
Senior Midwife
Fetal monitoring |
| Contact details: | 01872 252361 |
| Brief summary of contents | This gives guidance to obstetricians and midwives in the use of electronic fetal monitoring in labour, when to perform fetal blood sampling and in what circumstances paired cord samples should be taken. |
| Suggested Keywords: | CTG, EFM, monitoring, FBS, cord, labour, NICE fetal, blood, sampling, labour, paired, trace |
| Target Audience | RCHT | CFT | KCCG |
| Executive Director responsible for Policy: | Medical Director |
| Date revised: | June 2019 |
| This document replaces (exact title of previous version): | CLINICAL GUIDELINE FOR THE USE OF ELECTRONIC FETAL MONITORING IN LABOUR, FETAL BLOOD SAMPLING AND PAIRED CORD SAMPLING v4.0 |
| Approval route (names of committees)/consultation: | Maternity Guideline Group
Obs & Gynae Directorate
Divisional Board for noting |
| Care Group Manager confirming approval processes | Debra Shields |
| Name and Post Title of additional signatories | Not required |
| Name and Signature of Divisional/Directorate Governance | {Original Copy Signed} |
## Related Documents:

7. NICE (2014) handover of care in the Intrapartum care (CG190): Care of healthy women and babies during childbirth
10. NICE (2014) Intrapartum Care for Healthy Women and Babies (CG 190) Updated Feb 2017
Stakeholders bullet 2 (Updated 27-02-19)

**12. NHS Resolution (2019). The Early Notification scheme progress report: collaboration and improved experience for families**

| Training Need Identified? | Yes. Staff training and updating will be completed as per the RCHT Maternity Training Needs Analysis. |

### Version Control Table

<table>
<thead>
<tr>
<th>Date</th>
<th>Version No</th>
<th>Summary of Changes</th>
<th>Changes Made by (Name and Job Title)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 2006</td>
<td>V1.0</td>
<td>Initial document</td>
<td>Jan Clarkson Maternity Risk Manager</td>
</tr>
<tr>
<td>September 2009</td>
<td>V1.1</td>
<td>Updated in line with NICE Guidance</td>
<td>Jan Clarkson Maternity Risk Manager</td>
</tr>
<tr>
<td>December 2009</td>
<td>V1.2</td>
<td>Compliance monitoring added</td>
<td>Jan Clarkson Maternity Risk Manager</td>
</tr>
<tr>
<td>November 2010</td>
<td>V1.3</td>
<td>Updated to include NPSA alert statement ‘Staff using electronic fetal monitoring should be aware of its limitations and artefacts, such as doubling maternal heart rate being displayed’</td>
<td>Jan Clarkson Maternity Risk Manager</td>
</tr>
<tr>
<td>September 2012</td>
<td>V1.4</td>
<td>Reviewed no changes made to clinical content, changes to compliance monitoring only</td>
<td>Jan Clarkson Maternity Risk Manager</td>
</tr>
<tr>
<td>October 2016</td>
<td>V2.0</td>
<td>Major changes made in with FIGO 2015 Classification and the introduction of ST-analysis</td>
<td>Sally Budgen Senior Midwife, fetal monitoring Richard Keedwell, Obs &amp; Gynae Speciality Registrar</td>
</tr>
<tr>
<td>Date</td>
<td>Version</td>
<td>Review/Update Details</td>
<td>Author</td>
</tr>
<tr>
<td>---------------</td>
<td>---------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
</tbody>
</table>
| January 2019  | V3.0    | Review with amendments to:  
2.3.3 – Using the stamp for clarity  
2.3.5 – Ensuring the printer settings are correct.  
2.3.6 Adding the unique identifier to the MOSOS  
2.3.11 All intrapartum events to be noted on MOSOS  
2.3.12 any opinion from staff to be noted on MOSOS. Entries must be timed and clearly identifiable.  
2.9.2 ). A management plan indicating the most appropriate method for intrapartum fetal monitoring is documented  
2.12.4 All traces received to MOSOS will be electronically stored on the hospital server. Two hours after completion of the CTG, it will be sent, as a Pdf file, to that patient's E3 maternity record.  
2.12.2 All paper traces should be placed in a secure store envelope. The envelope should be hole-punched and filed chronologically in the maternal records. | Sally Budgen  
Senior Midwife, fetal monitoring |
2.2.7.Obtaining good quality CTG  
2.2.8 CTG when epidural is sited  
2.10.2. Fresh eyes by staff up to date with training  
2.10.4. Difficulty/ disagreement with classification  
2.14.1. Criteria for cord blood samples | Sally Budgen  
Fetal Monitoring Lead Midwife |
| November 2019 | V4.1    | Updated in response to NHS Resolution: The Early Notification scheme progress report: collaboration and improvement experience for families (2019) and 2.2.15 re removing the FSE and checking that it is complete. | Sally Budgen  
Fetal monitoring Lead midwife |
### Appendix 2. Initial Equality Impact Assessment Form

| Name of the strategy / policy / proposal / service function to be assessed | Electronic Fetal Monitoring (EFM), Fetal Blood Sampling (FBS) and Paired Cord Sampling Clinical Guideline V4.1 |
| Direct and service area: Obstetrics and Gynaecology | Is this a new or existing document: Existing |
| Name of individual completing assessment: Sally Budgen, Senior Midwife, Fetal Monitoring | Telephone: 01872 252361 |

#### 1. Policy Aim*

**Who is the strategy / policy / proposal / service function aimed at?**

The aim of this guideline is to give guidance to obstetricians and midwives in the use of electronic fetal monitoring in labour, when to perform fetal blood sampling and in what circumstances paired cord samples should be taken.

#### 2. Policy Objectives*

**Early detection of fetal hypoxia by means of electronic fetal monitoring and the appropriate management**

#### 3. Policy – intended Outcomes*

**Improved outcome for the new born baby**

#### 4. How will you measure the outcome?

**Compliance monitoring tool**

#### 5. Who is intended to benefit from the policy?

**All pregnant women**

#### 6a Who did you consult with

<table>
<thead>
<tr>
<th>Workforce</th>
<th>Patients</th>
<th>Local groups</th>
<th>External organisations</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Please record specific names of groups**

- Maternity Guidelines Group
- Obstetrics and Gynaecology Directorate
- Policy Review Group

#### 7. The Impact

Please complete the following table. **If you are unsure/don’t know if there is a negative impact you need to repeat the consultation step.**

<table>
<thead>
<tr>
<th>Equality Strands</th>
<th>Yes</th>
<th>No</th>
<th>Unsure</th>
<th>Rationale for Assessment / Existing Evidence</th>
</tr>
</thead>
</table>

Are there concerns that the policy could have differential impact on:
Age

<table>
<thead>
<tr>
<th>Age</th>
<th>x</th>
<th>All pregnant women</th>
</tr>
</thead>
</table>

Sex (male, female, trans-gender / gender reassignment)

<table>
<thead>
<tr>
<th>Sex</th>
<th>x</th>
<th>All pregnant women</th>
</tr>
</thead>
</table>

Race / Ethnic communities /groups

<table>
<thead>
<tr>
<th>Race / Ethnic communities /groups</th>
<th>x</th>
<th>All pregnant women</th>
</tr>
</thead>
</table>

Disability - Learning disability, physical impairment, sensory impairment, mental health conditions and some long term health conditions.

<table>
<thead>
<tr>
<th>Disability</th>
<th>x</th>
<th>All pregnant women</th>
</tr>
</thead>
</table>

Religion / other beliefs

<table>
<thead>
<tr>
<th>Religion / other beliefs</th>
<th>x</th>
<th>All pregnant women</th>
</tr>
</thead>
</table>

Marriage and Civil partnership

<table>
<thead>
<tr>
<th>Marriage and Civil partnership</th>
<th>x</th>
<th>All pregnant women</th>
</tr>
</thead>
</table>

Pregnancy and maternity

<table>
<thead>
<tr>
<th>Pregnancy and maternity</th>
<th>x</th>
<th>All pregnant women</th>
</tr>
</thead>
</table>

Sexual Orientation, Bisexual, Gay, heterosexual, Lesbian

<table>
<thead>
<tr>
<th>Sexual Orientation, Bisexual, Gay, heterosexual, Lesbian</th>
<th>x</th>
<th>All pregnant women</th>
</tr>
</thead>
</table>

You will need to continue to a full Equality Impact Assessment if the following have been highlighted:

- You have ticked “Yes” in any column above and
- No consultation or evidence of there being consultation - this excludes any policies which have been identified as not requiring consultation. or
- Major this relates to service redesign or development

8. Please indicate if a full equality analysis is recommended.  
   Yes | No | x
   
9. If you are not recommending a Full Impact assessment please explain why.
   Not indicated.

Date of completion and submission

<table>
<thead>
<tr>
<th>Date of completion and submission</th>
<th>6th June 2019</th>
</tr>
</thead>
</table>

Members approving screening assessment

<table>
<thead>
<tr>
<th>Members approving screening assessment</th>
<th>Policy Review Group (PRG) Approved</th>
</tr>
</thead>
</table>

This EIA will not be uploaded to the Trust website without the approval of the Policy Review Group.

A summary of the results will be published on the Trust’s web site.
Appendix 3. Definitions of CTG Features

**Baseline Fetal Heart Rate**
The mean FHR when it is stable, excluding accelerations and decelerations, is analysed over 10 minutes and expressed in beats per minute (bpm). The baseline value may vary between subsequent 10 minute sections.

- **Normal Baseline:** between 110 and 160 bpm. Preterm fetuses have a value at the upper end of this range, post term fetuses at the lower end.
- **Tachycardia:** a baseline value above 160 bpm lasting ≥ 10 minutes
- **Bradycardia:** a baseline value below 110 bpm lasting ≥ 10 minutes.
  Values between 100 and 110 bpm may occur in normal fetuses, especially in postdate pregnancies.

**Baseline Variability**
Refers to the oscillations in the FHR, evaluated as the average bandwidth amplitude of the signal in one minute sections.

- **Normal Variability:** a bandwidth with an amplitude of 5 to 25 bpm
- **Reduced Variability:** a bandwidth amplitude below 5 bpm for more than 50 minutes or for more than 3 minutes during decelerations.
  Following an initial normal intrapartum CTG, reduced variability due to hypoxia is very unlikely without preceding or concomitant decelerations and a rise in baseline.
- **Increased Variability** (Saltatory pattern): a bandwidth value exceeding 25 bpm lasting ≥ 30 minutes. May be due to rapidly evolving hypoxia and resultant fetal autonomic instability.

**Accelerations**
Transient increases in FHR above the baseline of 15 bpm or more, lasting more than 15 seconds, but less than 10 minutes. The absence of accelerations in an otherwise normal CTG is of uncertain significance. Their presence indicates fetal wellbeing.

**Decelerations**
Transient decreases in FHR below the baseline of 15 bpm or more, lasting 15 seconds or more.
Guidelines classify decelerations as early, variable and late. In reality, a combination of decelerations may occur.

- **Early Decelerations:**
  Uniform, repetitive, periodic slowing of FHR, coincident with contractions. Normal variability within the deceleration.
  They are believed to be caused by head compression and do not indicate fetal hypoxia/acidosis. These rarely occur alone representing 2% of decelerations.

- **Variable Decelerations:**
  The most common intrapartum deceleration.
  These vary in shape length and timing in relation to uterine contractions.
  **V-shaped** variable decelerations exhibit a rapid drop and recovery to the baseline. A transient rise in the FHR initially and at the end of the deceleration (shouldering) occurs.
  They translate a baroreceptor-mediated response to increased arterial pressure, as occurs with umbilical cord compression. These are uncomplicated and are seldom associated with significant fetal hypoxia/acidosis, unless they evolve to exhibit U-
shaped features, reduced variability within the decelerations and/or their duration exceeds 3 minutes.

**U-shaped** variable decelerations combine both baroreceptor and chemoreceptor mediated response. If they are recurrent, fetal acidosis will develop with time.

- **Late Decelerations:** U-shaped decelerations which are uniform and repetitive. They exhibit a gradual onset, starting more than 20 seconds after the onset of uterine contractions, with a gradual return to the baseline after the end of a contraction +/- reduced variability. These decelerations indicate a chemoreceptor-mediated response to fetal hypoxaemia.
  
  With reduced variability and lack of accelerations, the definition of late decelerations includes those with an amplitude of 10 to 25bpm.

- **Prolonged decelerations:** lasting more than 3 minutes. Likely to indicate fetal hypoxaemia.
  
  Decelerations exceeding 5 minutes with reduced variability and FHR < 80bpm are frequently associated with acute fetal hypoxia/acidosis.

**Sinusoidal pattern**

A regular, smooth, undulating pattern, resembling a sine wave with an amplitude of 5 to 15bpm and a frequency of 3 to 5 cycles per minute. Coincides with lack of accelerations, lasting more than 30 minutes. Pathophysiology includes severe fetal anaemia or fetal hypoxia.

Pseudo-sinusoidal patterns can be seen during fetal sucking and mouth movements; these tend to be "saw-tooth" in appearance.

**Fetal Behavioural states (Cycling)**

The occurrence of different behavioural states is a hallmark of fetal neurological responsiveness and absence of hypoxia/acidosis. Refers to periods of deep sleep, active sleep and wakefulness.

**Contractions**

The tocodynamometer demonstrates the frequency of contractions; the intensity and duration must be palpated and assessed. An increase in any of these features can contribute to FHR changes.

- **Tachysystole:** The occurrence of more than 5 contractions in 10 minutes, in two successive 10 minute periods, or averaged over 30 minutes.

- **Hyperstimulation:** excessive frequency and/or strength and/or duration of contractions resulting in FHR changes.
Appendix 4. Types Of Intrapartum Hypoxia

**ACUTE HYPOXIA**
- A sudden drop from the baseline, lasting at least 3 minutes (prolonged deceleration) becoming a bradycardia if sustained for 10 minutes.
- Fetal pH drops by 0.01 every minute
- If CTG normal prior to deceleration, the deceleration is ≥80bpm, with variability maintained within first 3 minutes and if non-reversible causes have been excluded, 95% will recover within 9 minutes

**MANAGEMENT**
- Exclude non-reversible causes (placental abruption, cord prolapse, uterine rupture)

**GRADUALLY EVOLVING HYPOXIA**
The most common type of intrapartum hypoxia. Evolves over time (hours); the fetus utilises compensatory mechanisms to avoid hypoxic damage
- Commences with decelerations
- Accelerations disappear
- Decelerations become deeper and wider
- Baseline heart rate then rises (compensatory catecholamine release)
- Decompensation (loss of variability)
- End stage myocardial hypoxia leading to terminal bradycardia

The rate of fall in fetal pH depends on:
- The intensity, duration and repetitive nature of the inciting event.
- The individual capacity of the fetus to compensate during mechanical and hypoxic intrapartum stresses

**MANAGEMENT**
- When a suspicious or worsening CTG is identified, the underlying cause must be addressed:
  - Intravenous fluids if maternal hypotension or dehydration.
  - Reduce/stop oxytocin infusion +/- administer terbutaline (250 mcg subcutaneously) if uterine hyperstimulation.
  - Postural changes to relieve cord compression and to reduce aorto-caval compression.
  - Additional methods to evaluate oxygenation will guide decisions regarding the time of delivery; ST analysis is recommended.
  - If there is a stable baseline with normal variability between the decelerations, continue labour and commence ST analysis.
  - If baseline variability is reduced despite corrective measures, depending on the clinical assessment, consider FBS prior to ST analysis or immediate delivery.

**SUB-ACUTE HYPOXIA**
Develops over 20 to 60 mins
- Fetal pH falls by 0.01 every 2 to 3 minutes
- May be seen during the active second stage of labour, or
- With uterine hyperstimulation (spontaneous or due to oxytocin administration)

**MANAGEMENT**
- Reduce strength and frequency of uterine contractions/ relieve aorto-caval compression/ hydrate.
- Stop active pushing if delivery is not imminent to improve utero-placental circulation.
- Consider additional methods to evaluate fetal oxygenation or immediate delivery if conservative measures are ineffective.

**ALWAYS INFORM THE DELIVERY SUITE COORDINATOR AND THE MIDDLE GRADE OBSTETRICIAN WHEN INTRAPARTUM HYPOXIA HAS BEEN IDENTIFIED**
- Review the previous CTG and preceding events.
- Exclude/ correct reversible causes:
  - Hyperstimulation: stop oxytocin +/- administer terbutaline
  - Maternal hypotension, (usually following epidural or spinal analgesia). Administer intravenous fluids. Anaesthetic review; Relieve aorto-caval compression by turning the woman to a left lateral position. Consider IV ephedrine. (Oxygen administration does not improve fetal oxygenation but may be considered as pre oxygenation for the mother)
  - If the CTG suggests a 95% likelihood of recovering by 9 minutes (as described), the 3-minute rule may apply:
    - Assessment, intruterine resuscitation and appropriate assistance called by 6 minutes. The woman transferred to theatre by 9 minutes and, if the CTG shows no sign of recovery, commence delivery at 12 minutes with the aim to deliver the baby by 15 minutes.
Appendix 5. Initial Cardiotocography (CTG) Assessment

<table>
<thead>
<tr>
<th>STAN number (if applicable): <strong>RC</strong>__</th>
<th>Is there normal variability?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the quality of the CTG interpretable?</td>
<td>Can you exclude chronic hypoxia?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Is the baseline fetal heart rate appropriate for gestational age?</td>
<td>Is ST-analysis indicated?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Is the baseline stable?</td>
<td>Has the patient read the “STAN in Labour” information leaflet?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Can ST-analysis be relied on?</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Management plan:

Date: ____________________  Time: ____________________  Signature: ____________________  Designation: ____________________