National Women & Infants Health Programme

QUICK SUMMARY DOCUMENT

Fetal Heart Rate Monitoring

This summary document is a resource for all clinicians working in healthcare in Ireland who are carrying out fetal heart rate monitoring on a woman in the antenatal and intrapartum period of their care.

Following a comprehensive literature review a number of evidence-based recommendations for fetal heart rate monitoring on a woman were agreed upon.

Key Recommendations

Section 1: Methods and Limitations of Fetal Heart Rate Monitoring	
1.	All women attending routine antenatal care should be offered auscultation of the fetal heart (FH) using a Pinard or Doppler from 23+0 weeks' gestation. The FH should be auscultated for at least 60 seconds and documented as a single rate in the healthcare record. The baseline FHR of 110 to 160 bpm should be considered as normal. The maternal pulse should be palpated simultaneously to differentiate between the maternal and fetal heart rates.
2.	Antenatal CTG is not recommended as part of routine antenatal care.
3.	The use of the external transducer of a CTG to confirm the fetal heart rate (FHR) should not be used.
4.	All women should be recommended to avail of a method of intrapartum FHR monitoring. The method of monitoring (intermittent auscultation/CTG) should depend on the individual assessment of risk factors.
5.	There is insufficient evidence to recommend the use of central monitoring.
6.	Due to the lack of evidence for its effectiveness in potentially preventable neonatal outcomes, computerised antenatal CTG should not be routinely recommended until further evidence is available.
7.	For the intrapartum period, there is insufficient evidence to recommend the use of Expert Systems.
8.	The use of ST waveform analysis (STAN) has made no significant difference to primary outcomes or babies with neonatal encephalopathy and therefore is not recommended.
9.	Intrapartum FHR monitoring (both IA and CTG) should be used as a tool to provide information on the fetal condition and should be reviewed as part of the overall clinical picture.
10.	All types of FHR monitoring are subject to limitations and clinicians should consider each individually when offering FHR monitoring.
Section 2: Information Sharing and Decision-Making	
11.	Discussions on the options of FHR monitoring should occur in the antenatal period. A national standardised evidence-based information leaflet should be used to guide the discussion.
12.	The discussion should include the methods of FHR monitoring, benefits, reliability, limitations and evidence to support the recommendation of a method of FHR monitoring.
13.	Shared decision-making and maternal choice should inform the method used. It is not necessary to revisit the woman's decision unless there are changes in the maternal or fetal condition

Section 3: FHR Monitoring in the Antenatal Period	
14.	Women with maternal or fetal risk factors should be offered antenatal CTG monitoring as part of their individualised pathway of care.
15.	Women identified as requiring antenatal FHR monitoring should have an individualised plan of care regarding the frequency and type of monitoring (IA/CTG).
16.	Women presenting between **23+0 and 25+6 weeks' gestation** with a pregnancy-related concern should be offered auscultation of the fetal heart to confirm fetal life.
17.	Women presenting between **26+0 to 27+6 weeks' gestation** with a pregnancy-related concern should be offered auscultation of the fetal heart as the first line of FHR monitoring to confirm fetal life. CTG monitoring should only be considered when there are risks of fetal hypoxia present. The decision for CTG monitoring should be made on a case-by-case basis by a senior obstetrician following a discussion with the woman. CTG should be performed and interpreted with caution, taking the clinical picture into account. A decision to expedite birth should not be made solely on the findings of an antenatal CTG.
18.	Women presenting from **28+0 weeks' gestation** with a pregnancy-related concern and who have risk factors that may affect fetal well-being should be offered CTG monitoring from 28+0 weeks' gestation as part of their individualised plan of care.
19.	A systematic assessment of the antenatal CTG should be performed and documented whenever the CTG is reviewed. The use of a standardised antenatal CTG pro forma for classification can aid systematic analysis. The CTG should be classified and documented as either ***normal* or *abnormal***. A sample antenatal CTG proforma can be found in Appendix 7.
20.	Where an antenatal CTG is assessed as abnormal following a systematic review, prompt escalation to the obstetric team and senior midwife is required. A plan of care should be documented in the woman's healthcare record.
Section 4: Intrapartum Risk Assessment	
21.	An initial risk assessment should be undertaken when a pregnant woman presents in early or established labour to determine the most appropriate form of FHR monitoring (IA or CTG).
22.	The decision to commence continuous intrapartum CTG monitoring in preterm labours less than 28+0 weeks' gestation should be made following a clinical assessment of the woman's condition, and a discussion between the woman, senior obstetrician and senior paediatrician/neonatologist. This discussion should include the likelihood of survival or severe morbidity of the preterm infant.
23.	A systematic assessment of the maternal and fetal condition should be undertaken every hour or more frequently if there are FHR concerns and documented in the healthcare record. The presence of new intrapartum risk factors should warrant an obstetric and midwifery team review. Continuous CTG monitoring should be recommended if not already in progress.
24.	The use of a buddy system/fresh eyes may be used as part of a regular systematic review which includes FHR monitoring (IA or CTG) and a review of antenatal and intrapartum risk factors.
25.	In the absence of any maternal or fetal risk factors, an admission CTG is not recommended.

Section 5: Intrapartum Fetal Heart Rate Monitoring	
26.	Confirming fetal health by IA should be undertaken using a structured approach. The assessment should include abdominal palpation and auscultation of the fetal heart using a Pinard or Doppler during a period of fetal movement to exclude fetal hypoxia. The maternal heart rate should be palpated on each occasion to differentiate between the two heart rates.
27.	The baseline FHR should be determined by auscultating the fetal heart for at least one minute between contractions and count the rate. The baseline FHR should range between 110-160 bpm. A single figure should be documented in the healthcare record.
28.	When performing IA, the maternal pulse should be palpated simultaneously to ensure differentiation between the maternal and fetal heartbeats.
29.	When auscultating the fetal heart, the presence of accelerations and/or decelerations should be recorded in the healthcare record.
30.	In the event of no fetal heartbeat being detected, urgent real-time ultrasound assessment should be offered to check fetal viability and an obstetric review should be sought.
31.	In the first stage of labour, IA should be carried out immediately after a palpated contraction for at least one minute and repeated at least once every 15 minutes.
32.	Once the woman shows signs of the second stage of labour or is confirmed to be in the second stage of labour, IA should be undertaken immediately after a palpated contraction for at least one minute and repeated every 5 minutes or after every contraction – whichever comes first.
33.	If there are concerns about differentiating between the maternal heart rate and FHR, changing the method of FHR monitoring is recommended.
34.	The fetal heart should be recorded as a single rate on the partogram and/or in the woman's healthcare record.
35.	The presence of any new or developing intrapartum risk factors warrants a transition from IA to CTG monitoring.
36.	If FHR concerns are suspected during intermittent auscultation, the FHR should be auscultated more frequently (i.e., after 3 consecutive contractions). If FHR concerns are confirmed, escalate care and recommend continuous CTG monitoring.
37.	If, during IA, there is an increase in the FHR of 20 bpm or more from the beginning of labour or if a deceleration is heard, care should be escalated and continuous monitoring should be commenced.
38.	Where a CTG has been commenced due to concerns arising from IA and is classified as normal after 20 minutes, and there are no intrapartum maternal or fetal risk factors present, IA can be recommenced.
39.	If during IA, there is difficulty in auscultating the FHR for at least one minute following a palpated contraction, and the difficulty in auscultating persists despite taking remedial actions, continuous CTG monitoring is recommended.
40.	Prior to commencing intrapartum CTG monitoring, the woman should be provided with a full explanation of the rationale for continuous CTG monitoring, which should be documented in her health care records.
41.	Prior to commencing CTG monitoring, fetal life should be confirmed independently by auscultating the fetal heart using a Pinard or Doppler and simultaneously palpating the maternal pulse.

42.	The maternal pulse rate should be continuously monitored and recorded on the CTG by either pulse oximetry (Sp02) or the Toco MP transducer plate. If there are any concerns that the CTG is not differentiating the FHR signal from the maternal HR, or when unable to determine the baseline FHR between consecutive contractions: The FHR should be confirmed by independent means, including verification of the FHR with a fetal stethoscope/Pinard, ultrasound imaging, application of a fetal scalp electrode (where appropriate) The maternal HR should be verified by using either pulse oximetry (Sp02), the Toco MP transducer plate, maternal ECG or manual determination of the maternal pulse
43.	When monitoring multiple pregnancies, the offsetting function on the CTG should be used to enable a more accurate assessment of each FHR. This separates the baselines by an offset of 20 bpm by switching on trace separation. Unless contraindicated, an FSE to monitor twin one should be considered.
44.	The CTG trace should be of sufficient quality to facilitate the interpretation of its features. If not, remedial action should be taken to improve the quality of the trace (for example, by repositioning the toco transducer plate or using a fetal scalp electrode where appropriate).
45.	A standardised intrapartum CTG pro forma for classification should be used to aid a systematic analysis of the CTG. The classification provided by NICE Fetal Monitoring in Labour (2022) should be used to categorise the intrapartum CTG in conjunction with the assessment of antenatal and intrapartum maternal and fetal risk factors. Intrapartum CTGs should be categorised as ***normal, suspicious or pathological.*** These terms should be used to describe the CTG and when seeking an obstetric review.
46.	In the first stage of labour, the CTG should be categorised and documented at least every hour or sooner if there are FHR concerns.
47.	In the passive second stage of labour, the CTG should be categorised and documented at least every hour or sooner if there are FHR concerns.
48.	In the active second stage of labour, the CTG should be categorised and documented at least every 30 minutes however if there are FHR concerns, an obstetric review should be obtained. At all times, the necessary escalation based on CTG features should not be delayed until the next CTG classification is due. CTG concerns should be relayed to the obstetrician and senior midwife in a timely fashion regardless of the timing of classification.
49.	In the active second stage of labour, if there are concerns in the differentiation of the maternal and FHR, a fetal scalp electrode (FSE) should be considered. If a Fetal Scalp Electrode (FSE) cannot be applied, urgent obstetric review should be sought.
50.	All relevant events which may affect the FHR (e.g. vaginal examinations, changes in maternal position, vomiting, toilet breaks, fetal movements) should be annotated on the CTG trace.
51.	It is recommended that decisions regarding the management of labour should be made based on the overall clinical picture and include maternal observations, contraction frequency and labour progress.
52.	In the event of a CTG remaining pathological after implementing conservative measures (addressed in CQ 2.17) further obstetric and midwifery review should be sought and expediting birth should be considered. If there are evolving intrapartum risk factors for fetal compromise such as slow progress, sepsis or meconium, there should be a lower threshold for expediting birth.
53.	Conservative measures should be used to resolve any possible underlying causes, such as maternal hypotension, tachysystole, and maternal aortocaval compression.
54.	The administration of IV fluids should not be used routinely as part of conservative measures to treat FHR abnormalities.

55.	The administration of maternal facial oxygen as part of conservative measures to address FHR concerns is not recommended.
56.	Urgent action should be taken to resolve any FHR concerns in the second stage of labour; however, if there is no improvement, an urgent obstetric review should be obtained, and birth expedited.
57.	Fetal scalp stimulation and fetal blood sampling may be considered as second-line tests to CTG monitoring when there are FHR concerns. The following factors should be taken into consideration when making the decision to use FSS or FBS; the invasiveness of the procedure, availability of resources, the time the procedure takes and the woman's wishes.
Section 6: Storage of CTGs	
58.	CTG traces should be considered as part of the maternal healthcare record and should be stored electronically if possible. CTGs and associated maternal healthcare records should be retained indefinitely – up to the lifetime of the woman and eight years after death.

Figures

Figure 1: Antenatal CTG parameters

CTG features	Normal parameters	Description
Baseline rate	110-160 bpm	Determine baseline FHR by looking at the mean FHR, excluding accelerations and decelerations, over a period of 10 minutes when the FHR is stable
Baseline variability	5-25 bpm	Refers to the minor oscillations in the FHR, which usually occur at 3 to 5 cycles a minute. It can be calculated 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
Accelerations	Presence of accelerations	Transient increases in FHR of 15 bpm or more, lasting 15 seconds
Decelerations	No decelerations	Transient episodes when the FHR slows to below the baseline level by more than 15 bpm, with each episode lasting 15 seconds or more

Figure 2: Initial risk assessment to determine the appropriate intrapartum FHR monitoring

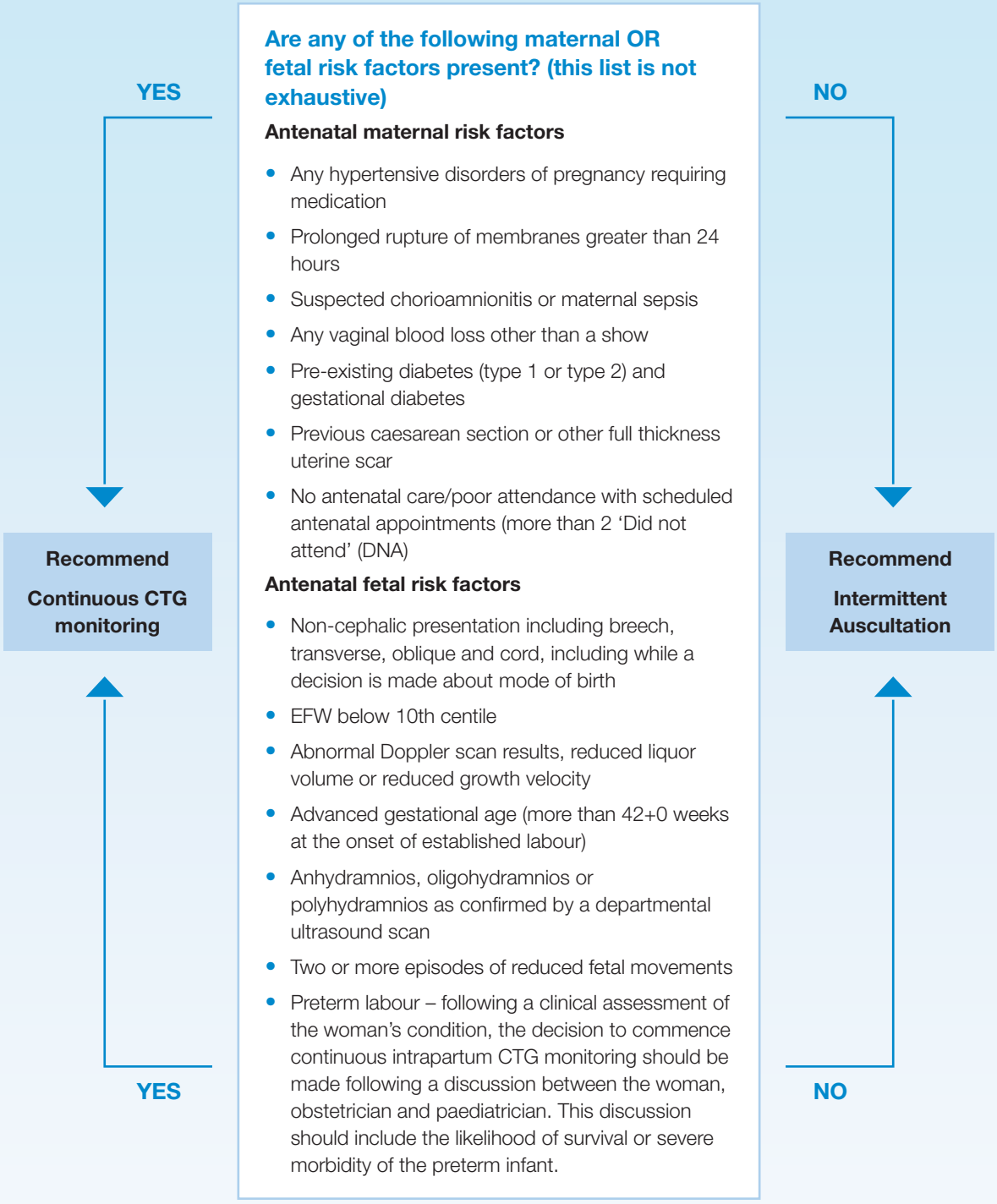

Figure 3: Ongoing risk assessment to determine the appropriate intrapartum FHR monitoring

Are any of the following risk factors present?

- Contraction lasting more than 2 minutes (hypertonus)
- 5 or more contractions in 10 minutes for at least 20 minutes
- Meconium stained liquor (any grade)
- Fresh vaginal bleeding that develops in labour
- Blood-stained liquor not associated with VE
- Use of oxytocin
- Maternal pyrexia (≥38°C on a single reading or 37.5°C or above on 2 consecutive occasions 1 hour apart)
- Suspected chorioamnionitis or sepsis
- Pain reported by the woman that appears to differ from the pain normally associated with contractions
- Maternal pulse over 120 bpm on 2 occasions 30 minutes apart
- Severe hypertension (a single reading of either systolic of ≥160 mmHg or diastolic of ≥110 mmHg Hypertension (either systolic ≥140 mmHg or diastolic ≥90 mmHg on 2 consecutive readings taken 30 minutes apart)
- A reading of 2+ of protein on urinalysis and a single reading of either raised systolic blood pressure (≥140 mmHg) or raised diastolic blood pressure (≥90 mmHg)
- Confirmed delay in the first or second stage of labour
- Regional analgesia: In cases where antenatal or intrapartum maternal or fetal risk factors are present, continuous CTG monitoring is recommended during epidural placement and for the duration of labour. In the absence of antenatal or intrapartum maternal or fetal risk factors, CTG monitoring should be commenced once the epidural is sited.
- Consider continuous CTG monitoring if, based on clinical assessment and obstetric and midwifery review, there are concerns about other intrapartum factors not listed above that may lead to fetal compromise.

YES

If using IA, convert to continuous CTG monitoring

If already using continuous CTG monitoring, consider existing and evolving maternal/fetal risk factors in conjunction with CTG findings

Ongoing risk assessment should be performed hourly

NO

Continue using IA if there are no antenatal/ intrapartum risk factors

Ongoing risk assessment should be performed hourly

Figure 4: Intrapartum CTG parameters (NICE 2022)

Contractions defined as bell-shaped gradual increases in the uterine activity signal followed by roughly symmetric decreases, with 45-120 seconds in total duration [1].

Tachysystole: a frequency of 5 or more contractions in 10 minutes [2]

Hypertonus: a contraction lasting 2 minutes or longer [2]

Normal	Up to 4 contractions in 10 minutes [2]
Suspicious	5 or more contractions in 10 minutes, leading to reduced resting time between contractions **or** hypertonus
Pathological	
Actions	If 5 or more contractions per 10 minutes are present, perform a full risk assessment and take action to reduce contraction frequency [2]

Baseline fetal heart rate (FHR)

Determine baseline FHR by looking at the mean FHR, excluding accelerations and decelerations, over a period of 10 minutes when the FHR is stable. When deciding if there is any change in baseline FHR, compare it with earlier CTG traces or recordings of FHR [2]

Stable baseline: usually 110 to 160 beats per minute (bpm). Lower FHR's are expected with post-term pregnancies, with higher baseline rates in preterm pregnancies [2]. When deciding if there is any change in baseline FHR, compare it with earlier CTG traces or recordings of FHR.

Rising baseline:

A rise in baseline FHR defined as an increase of 20 bpm or more from the previous stable baseline rate may represent either developing infection or hypoxia [2].

Normal	Stable baseline of 110 to 160 bpm
Suspicious	Increase in baseline FHR of 20 bpm or more from the start of labour or since the last review an hour ago, **or** 100 to 109 bpm **or** unable to determine baseline
Pathological	Below 100 bpm, **or** above 160 bpm **or** an increase in the baseline FHR of 20 bpm or more in active second stage labour [2]

Variability refers to the minor oscillations in the FHR, which usually occur at 3 to 5 cycles a minute. It can be calculated 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. The absence of variability is considered a very concerning feature [2]

Normal	5 to 25 bpm
Suspicious	Fewer than 5 bpm for between 30 and 50 minutes, **or** more than 25 bpm for **up to** 10 minutes
Pathological	Fewer than 5 bpm for **more than** 50 minutes, **or** more than 25 bpm for more than 10 minutes, **or** sinusoidal

Actions	**Obtain an urgent review by an obstetrician or senior midwife and consider expediting birth if:** there is an isolated reduction in variability to fewer than 5 bpm for more than 30 minutes when combined with antenatal or intrapartum risk factors, as this is associated with an increased risk of adverse neonatal outcomes, **or** there is a reduction in variability to fewer than 5 bpm combined with other CTG changes, particularly a rise in the baseline FHR, as this is a strong indicator for fetal compromise [2]

Decelerations: Transient episodes when the FHR slows to below the baseline level by more than 15 bpm, with each episode lasting 15 seconds or more. An exception to this is that in a trace with reduced variability, decelerations may be 'shallow'. Decelerations in the intrapartum period should be described as **'early'**, **'variable'** or **'late'** [2]

Early decelerations: Repetitive and periodic slowing of the FHR with onset early in the contraction and return to baseline at the end of the contraction. These are uncommon, benign and usually associated with head compression. They are not accompanied by any other changes, such as reduced variability or a rise in the baseline FHR [2]

Variable decelerations: Intermittent and periodic slowing of the FHR with a variable time in relation to the contraction [2]. The following characteristics of variable decelerations should be considered as **concerning***:

- Lasting more than 60 seconds
- Reduced variability within the deceleration
- Failure or slow return to baseline FHR
- Loss of previously present shouldering.

Shouldering: is defined as a slight increase in heart rate preceding and/or following decelerations [3]

Late decelerations: Repetitive and periodic slowing of the FHR with onset mid to end of the contraction and the lowest point more than 20 seconds after the peak of the contraction, and ending after the contraction [2]

Prolonged deceleration: single prolonged deceleration lasting 3 minutes or more [2]

Repetitive decelerations: decelerations that occur with over 50% of contractions

Normal	No decelerations, **or** early decelerations, **or** variable decelerations that are not evolving to have **concerning characteristics***
Suspicious	Repetitive variable decelerations with any concerning characteristics for less than 30 minutes, **or** variable decelerations with any concerning characteristics for more than 30 minutes, **or** repetitive late decelerations for less than 30 minutes
Pathological	Repetitive variable decelerations with any concerning characteristics for more than 30 minutes, **or** repetitive late decelerations for more than 30 minutes, **or** acute bradycardia, or a single prolonged deceleration lasting 3 minutes or more

Accelerations: Transient increases in FHR of 15 bpm or more, lasting 15 seconds or more [2]. In the intrapartum period, the presence of FHR accelerations, even with reduced variability, is generally an indication that the baby is healthy. The absence of accelerations on an otherwise normal CTG trace does not indicate fetal acidosis [2].

Overall classification of intrapartum CTG (contractions, baseline, variability, decelerations) (NICE, 2022)

Normal	All 4 features are normal
Suspicious	Any 1 feature is suspicious
Pathological	Any 1 feature is pathological **or** 2 or more features are suspicious

Figure 5: Decision making on how to manage labour should be based on the overall clinical picture, including maternal observations, contraction frequency and labour progress

Classification	Recommended Actions
Normal:	• Continue standard care • In the event that the CTG was commenced due to FHR concerns arising from IA, and there are no antenatal or intrapartum risks factors present, fetal monitoring can revert to IA, if the women wishes
Suspicious and there are no other concerning factors:	• If the CTG was previously normal, consider possible underlying causes for the change in the FHR and take conservative measures (addressed in CQ 2.17)
Suspicious and there are additional intrapartum risk factors such as slow progress, sepsis or meconium:	• Possible underlying causes should be considered and if present, conservative measures should be undertaken • An urgent review by an obstetrician and senior midwife should be obtained and documented in the HCR
Pathological:	• An urgent review by an obstetrician and senior midwife should be obtained • Acute events such as cord prolapse, suspected placenta abruption or suspected uterine rupture should be considered • Other possible underlying causes should be considered and if present, conservative measures should be undertaken
If the CTG remains pathological after implementing conservative measures:	• Obtain a further urgent review by an obstetrician and senior midwife • Evaluate the whole clinical picture and consider expediting birth. If there are evolving intrapartum risk factors for fetal compromise, there should be a low threshold for expediting birth
Acute bradycardia or a single prolonged deceleration for 3 minutes or more:	• Obtain an urgent review by an obstetrician and senior midwife • If there has been an acute event such as cord prolapse, suspected placenta abruption or suspected uterine rupture, expedite birth • Possible underlying causes should be considered and if present, conservative measures should be undertaken • Preparations should be made for an urgent birth and include a request for paediatric or neonatal support in line with local obstetric emergencies activation protocols • If the acute bradycardia persists for 9 minutes, or less if there are significant antenatal or intrapartum risk factors for fetal compromise, expedite birth • If the FHR recovers at any time up to 9 minutes, reassess any decision to expedite the birth, but consider other antenatal and intrapartum risk factors • If a decision is made to expedite birth, the timings should be documented in the healthcare record and include the time of seeking an urgent review and the time of the decision was made

Auditable standards

Audit using the key recommendations as indicators should be undertaken to identify where improvements are required and to enable changes as necessary, and to provide evidence of quality improvement initiatives.

Auditable standards for this guideline include:

1. Classification of antenatal CTG as normal or abnormal
2. Appropriate method of intrapartum FHR monitoring, based on the woman's initial risk assessment, ongoing risk assessments and maternal choice
3. Appropriate classification of intrapartum CTG as normal, suspicious or pathological
4. Appropriate utilisation of IA
5. Utilisation of telemetry wireless monitoring

Recommended reading:

1. HSE nomenclature/glossary for audit www.hse.ie/eng/about/who/nqpsd/ncca/nomenclature-a-glossary-of-terms-for-clinical-audit.pdf
2. HSE National Framework for developing Policies, Procedures, Protocols and Guidelines How_to_Develop_HSE_National_Policies_Procedures_Protocols_and_Guidelines_gQBQ4os.pdf
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