Worcestershire Acute Hospitals NHS Trust

Antenatal Fetal Monitoring and Computerised CTG analysis

This guidance does not override the individual responsibility of health professionals to make appropriate decision according to the circumstances of the individual patient in consultation with the patient and /or carer. Health care professionals must be prepared to justify any deviation from this guidance.

Introduction.

To ensure that ALL medical and midwifery staff of whom are expected to review and interpret CTG traces have completed their Fetal Monitoring/ Mandatory training annually. Study leave must be provided to ensure staff attend/complete mandatory training.

To ensure that there are adequate resources of equipment to enable all types of fetal monitoring to be undertaken.

This guideline is for use by the following staff groups:
Obstetric Medical Staff and Midwives

Lead Clinician

Kate Griffiths	Fetal Monitoring Lead Midwife
Fiona Ross	Consultant Obstetrician - Fetal Monitoring Lead
Approved by *Maternity Governance Meeting* on:	27/03/2026
Approved by Medicines Safety Committee on:	N/A
Review Date: This is the most current document and should be used until a revised version is in place	27/03/2029

Key amendments to this guideline

Date	Amendment	Approved by:
July 2023	Review in line with new NICE guidance & physiological CTG interpretation	MGM
February 2025	Review to clarify computerised CTG should not be commenced following start of IOL. Updated to include all pregnancies requiring CTG from 26 weeks.	MGM
March 2026	Updates in relation to process if criteria not met	MGM

Contents

Introduction

Continuous electronic fetal monitoring (CEFM) is recording of the fetal heart rate obtained via an ultrasound transducer placed on the mother's abdomen and was introduced as a tool to reduce perinatal mortality and cerebral palsy. Evidence does not support the use of CEFM for fetal assessment in women with an uncomplicated pregnancy and therefore it should not be offered to these women (NICE 2008). For women who are considered low risk, the appropriate method of fetal heart monitoring during the antenatal period is either a handheld Doppler device and/or Pinard. CTG is widely used in pregnancy as a method of assessing fetal well-being, predominantly in pregnancies with increased risk of complications. The antenatal CTG is essentially a screening test for fetal well-being as an abnormal Antenatal CTG may lead to a range of further actions which may include further testing, hospital admission, or delivery.

Aims and Objectives

To identify Fetus' at risk of intrauterine hypoxia and acidaemia and to provide timely, appropriate intervention to avoid fetal neurological damage or death.

To ensure that all Medical and Midwifery staff provide safe care to women during the antenatal period including Induction of Labour.

To ensure that the correct identified group of women receive CEFM.

To ensure that the maternal pulse is palpated, and the fetal heart is auscultated at the commencement of the CTG for 60 seconds.

To ensure that the CTG is reviewed systematically every 20 minutes if it is being continued.

To ensure that the correct actions are undertaken when a CTG is identified as abnormal.

To ensure that CTG recordings/ reviews are securely documented in the medical records.

Definitions

CEFM – Continuous Electronic Fetal Monitoring
FHR – Fetal Heart Rate
CTG – Cardiotocograph
DR- Dawes-Redman
STV- Short term variation

/

Indications for Antenatal CEFM:

- Reduced fetal movements (RFM)
- Intrauterine fetal growth restriction (IUGR)
- Antepartum haemorrhage (APH)
- Abdominal pain/ suspected abruption
- Hypertension or pre-eclampsia (at diagnosis)
- Maternal accident or trauma to abdomen
- Maternal diabetes

NB. This list is not exhaustive, if any obstetric concerns, a CTG should be undertaken and discussed with a senior registrar or consultant obstetrician.

The FHR should always be auscultated with a Pinard or handheld Doppler prior to the CTG and recorded with the mother's pulse rate to avoid recording the maternal heart rate in the case of intrauterine fetal death.

A CTG should not be interpreted in isolation, the clinical situation must always be considered, taking into account risk factors and examination findings and any previous CTG recordings if available.

Parameters

For a reassuring Antenatal CTG trace:

- Accelerations present
- Baseline between 110 –160 bpm
- Variability >5bpm
- No decelerations
- No uterine activity

**Baseline Heartrate >150 from 37-38weeks, caution needs to be exercised as the mean FHR at term is 140.

A study by Ghi T and et all 2022, showed Baseline Heartrate between 150 and 160 bpm at 40 weeks or beyond, is associated with

- A higher incidence of meconium-stained amniotic fluid
- Maternal hyperpyrexia
- Emergency CS for suspected fetal distress (OR10.7),
- Apgar <7 at 5th min
- Neonatal academia (OR and adverse composite neonatal outcome).

Therefore, if BHR>150 for a term baby, it is likely to be ominous and underlying chronic hypoxia and chorioamnionitis (subclinical/clinical) should be considered.

Baseline stability is the most important feature of the CTG trace.

All of the above should be commented on and documented in the notes.
If the CTG is reassuring, the fundal height measurement indicates normal growth, fetal movements are reported as normal and there are no associated complaints, the woman can be reassured and the original plan of care followed.

If reports of reduced fetal movements are made, the policy for "Reduced Fetal Movements" should be adhered to.

If the CTG is abnormal the Obstetric team should be asked to review the patient urgently.

Prior to 26 weeks gestation a CTG should not be performed, and auscultation of fetal heart should be undertaken with either Sonic aid or Pinard.

Rise in Baseline from previous CTG

If a rise in baseline > 10% is identified from previous CTG recording, a repeat CTG is indicated within two hours regardless of DR criteria meeting. If the repeat CTG baseline remains raised but stable for a full SNR, obstetric review incorporating the wider clinical picture and plan with a minimum of a further repeat CTG within 24 hours.

Computerised CTG

Computerised CTG is an expert assistant for CTG interpretation however the final clinical judgement should be based on the entire clinical assessment.

The Dawes Redman computerised CTG analysis should be used as an aid when interpreting AN CTGs unless it is contraindicated and then should not be used. Contraindications include suspected labour or when an induction of labour has been commenced.

Computerised CTG analysis should be offered for women with reduced fetal movements or other fetal, maternal concerns from 26 Weeks
When undertaking a computerised CTG it is important you are aware of the reason it is being undertaken and the implications this may have on the CTG, how it presents and reasons why it may not appear as you think it would.

Where the analysis will look at specific criteria parameters (See Appendix 1) and when these are met the CTG machine will highlight a criteria met conclusion and you will be able to print the report out with this information. The minimum period of analysis prior to a criteria meeting is 10 Minutes

If, however, criteria has not been met by the end of one hour (60 minutes) the trace would state that the criteria had not been met, it will also give you codes as to why the criteria has not been met and in some situations it will also highlight a found concern, example of this would be a comment such as sinusoidal rhythm found, highly abnormal, (see example in appendix 4)

If the Criteria is not met at 60 mins, then escalation for an obstetric review is required informing the obstetrician why the criteria has not been met. The CTG then needs to be repeated within an hour.

If the Computerised CTG does then not meet a second time, further escalation to the obstetric reg and or consultant is needed, and further plans of care need to be actioned - See flow chart for the management (Appendix 5)

In the case of a severely abnormal CTG, 60 mins is not needed to determine that the criteria would not be met and immediate escalation is required.

When interpreting a CTG if able to do so look at previous CTG traces to compare against each other.

The Computerised CTG analysis should not be used under 26 weeks gestation and must **NOT** be used for intrapartum CTG analysis or when induction of labour has been commenced.

Computerised CTG criteria considers the standard features of visual assessment such as accelerations, decelerations and basal heart rate, as well as parameters which are difficult or impossible to measure

visually, such as STV, sinusoidal rhythm and the number of minutes of high variation. The CTG is analysed considering:

- STV of 3 minutes or greater
- No evidence of a sinusoidal rhythm
- At least one episode of high variation
- No large or repeated decelerations
- Accelerations and / or fetal movements
- No evidence of a change in baseline
- A normal basal heart rate (if the trace is short).

Procedure for commencing computerised CTG.

1. Note past medical and obstetric history and the progress of the current pregnancy.
2. Enquire about fetal movements.
3. Gain consent for performing an abdominal palpation. Ensure bladder is emptied prior to measuring and plotting SFH on customised growth chart if not measured within the last 2 weeks and consider if growth scan is indicated.
4. Auscultate the fetal heart with a Sonic aid or Pinard for 1 minute. If the fetal heart is not heard, a scan must be performed to identify the fetal heart.
5. Commence the CTG and clearly document patient identification and maternal pulse on the CTG sticker.
6. Ask the patient to record any fetal movements whilst on the monitor using the fetal movement button.
7. Start analysis on the machine, ensuring to insert the correct gestation into the monitor and print the trace.
8. Paper copies of CTG traces should be filed in the patients notes to ensure they are able to be scanned in appropriately.
9. Computerised CTG Analysis should be documented clearly on Badgernet, and if criteria has not been met, the reasons why should be commented on.

Meeting Computerised CTG criteria

The CTG monitoring can be discontinued once the Computerised CTG criteria are met, the duration is longer than 20 minutes and the clinician is reassured the CTG is within expected range for that Fetus.

If the report highlights 'Criteria Not Met' then compared to comparable gestations, there is insufficient evidence of normality to be reassured at this stage.

In the first incident of a criteria not meeting at 60 Min the monitoring should be repeated, , the reasons as to why it has not met will be listed numerically on the printout of the report, the significance of these meaning and the timescale to be repeated and the management are outlined in (Appendix 2).

STV

Short term variability (STV) is a good indicator or fetal wellbeing, for a true STV to be determined, 60 minutes of CTG tracing is required and therefore providing the CTG is **NOT** severely abnormal, A Computerised CTG should be left for the full 60 minutes if not meeting criteria to calculate the STV correctly.

If the CTG is abnormal, there should be **NO** delay in waiting to obtain a STV and immediate escalation to the Obstetric team should be instigated.

STV values are dependent on the gestation. See Appendix 3 as an aid to guide management on STV in relation to the gestation and the risk of acidosis.

Any STV that at 60 mins is not in the reassuring / within the expected range must be escalated to the Obstetric team urgently and a plan of care made in relation to the STV and the clinical picture.

If the repeated 2nd CTG then Meets the Dawes Redman Criteria and is visually normal the CTG can be discontinued, and a full obstetric Reg / Consultant review should be undertaken to form plan of care.
Appendix 5 shows the flow chart of management if the repeated CTG does not meet and the management of this.

Other Sites

If the Criteria is NOT Met and the STV is Less than <4ms but more than >3ms at either Kidderminster or Redditch site, then the patient requires transfer to Worcester immediately

If an STV is less than <3ms when at the Kidderminster or Redditch sites, then a 999-time critical ambulance should be arranged

If delivery is not indicated immediately, but early delivery may be required, Antenatal Steroids should be considered, with appropriate counselling.

Sinusoidal Rhythm

If a sinusoidal rhythm is present and not settled after 20 minutes escalate to the Registrar or Obstetric Consultant urgently.

Sinusoidal patterns are associated with either severe fetal anaemia or severe fetal hypoxia with acidosis and are associated with poor fetal outcomes. Where a diagnosis of Sinusoidal FHR pattern is made, immediate intervention is required with probable emergency delivery if intrauterine resuscitation is not appropriate.

No accelerations

If no accelerations are present in an antenatal CTG, where Dawes Redman is not being used the trace should be continued and be reviewed by a senior registrar or Obstetric consultant).

CTG/Computerised CTG monitoring does **NOT** replace clinical judgement, therefore if there are any other associated signs, symptoms or concerns, despite Computerised CTG criteria being met, the obstetric team should be informed.

If the Computerised CTG system is not available, the CTG should be performed for 20-40 minutes ensuring good variability, the presence of accelerations, a normal stable baseline and no decelerations The CTG if reviewed and deemed normal can be discontinued; this should be agreed and signed by 2 registered midwives and documented clearly in the notes.

If the CTG has any abnormal features, an urgent review by Senior Registrar or Obstetric Consultant is required.

Induction Of Labour

Dawes Redman computerised assessment should not be used once IOL has been commenced. This is due to the inaccuracy of the report in the presence of uterine activity, regardless of if its felt or not.

Antenatal CTG Fresh Eyes

All Antenatal CTG's using Dawes Redman analysis should be printed and on completion be analysed and signed by another midwife or obstetrician so fresh eyes have seen the trace if it is agreed that the CTG meets the normal parameters of an Antenatal CTG.

How often CTG traces should be performed antenatally.

See the table below for intensity of necessary CTG monitoring for antenatal induction patients prior to the onset of labour.

Please note, the whole clinical situation should be considered and if there is any uncertainty or concerns regarding the regularity of fetal monitoring, the obstetric team should be consulted.

For inpatients not requiring induction, an individualised plan should be made as part of their plan of care and the relevant table below should be used as a guide to determine CTG frequency.

Daily CTG	**Twice daily CTG**
Routine post-dates	Growth <10th centile/Static growth on USS
Diet control GDM with normal size baby	Preterm <37/40
Maternal request	Post dates
Maternal age	Elevated PI but normal EDF
Pelvic girdle dysfunction	Reduced fetal movements
Large for dates	PET/PIH
Polyhydramnios	SROM <37/40
	Oligohydramnios
	DCDA twins
	Diabetics on metformin or insulin
	Obstetric Cholestasis
	History of Antepartum haemorrhage resulting in decision for IOL– not actively bleeding

Appendix 1
Dawes Redman Assessment Criteria Appendix

1. **Baseline Fetal Heart Rate (FHR)**
   - The average heart rate over time.
   - Must be within the **normal range (110–160 bpm)**. Gestation considered.

2. **Short-Term Variability (STV)**
   - Beat-to-beat variation in FHR, measured in milliseconds.
   - Reflects **instantaneous changes** and Fetal autonomic nervous system health.
   - A **low STV (< 3 ms)** can suggest **Fetal hypoxia**.

3. **Long-Term Variability (LTV) / Episode Analysis**
   - Fluctuations of the FHR over longer periods (minutes).
   - The system checks for **episodes of high and low variability** — a healthy trace shows alternating episodes.

4. **Accelerations**
   - Transient increases in FHR (usually ≥10 bpm for ≥15 seconds).
   - Presence of accelerations indicates **good Fetal health and oxygenation**.

5. **Decelerations**
   - Temporary drops in FHR.
   - **Any repetitive or prolonged decelerations** are considered **abnormal**.

6. **Episodes of High Variation**
   - Periods where the variability is high (STV and LTV both within normal limits).
   - At least one episode of high variation must be present for a trace to be considered normal
   -

7. **Episodes of Low Variation**
   - Periods where variability drops below threshold levels.
   - The criteria ensure these are **not excessive or prolonged**.

8. **Fetal Movements**
   - Detected by the transducer.
   - Should correlate with **accelerations** in a normal trace.

9. **Signal Loss / Data Quality**
   - Ensures the recording is long enough (typically **≥10 minutes of analyzable data**).
   - Too much **signal loss (>30%)** invalidates the trace.

10. **Time from Start of Recording**
    - The system won't analyze until there's **sufficient data (≥10 minutes)** and certain parameters stabilize.

11. **Heart Rate Sinusoidal Pattern**
    - Checks for **sinusoidal patterns**, which are **abnormal** and may indicate severe fetal anemia or hypoxia.

12. **Autocorrelation Function**
    - A statistical check used by the computer to confirm **true beat detection** and **signal reliability**.

Appendix 2 Not Met Management Plan

Code	Reason criteria not met	Management. If 1st Time Criteria Not Met
1	Basal heart rate outside normal range	Escalate to Obstetric team Reg / Consultant Consider further assessment of wellbeing or possible delivery dependant on clinical picture CTG to continue.
2	Large decelerations	Escalate to Obstetric team Reg / Consultant. Restart CTG, if any other abnormal features inform Obs team of this and highlight urgent need for review. Consider transfer to D/Suite. CTG to continue
3	No episodes of high variation	If STV is normal for gestation CTG can be discontinued. Repeat within 2 Hours Inform Obstetric team of situation.
4	No movements and fewer than 3 accelerations	Escalate to Obstetric team Reg / Consultant for review, If No other concerning features repeat the CTG within 2 hours.
5	Baseline fitting is uncertain	Escalate to Obstetric team Reg / Consultant for review, If No other concerning features repeat the CTG within 2 hours.
6	Short-term variation is less than 3 ms	URGENT escalation to Obstetric team Reg / Consultant for review, look at gestation expectation parameters and consider delivery. CTG to continue
7	Possible error at the end of the record	Restart Dawes Man criteria analysis straight away, Inform Obstetric team / reg consultant of criteria not met for review.
8	Decelerations at the end of the record	If a deceleration is suspected at the end of the CTG analysis continue CTG immediately and restart Dawes Redman criteria, escalate to Obstetric team if any concerning features.
9	High-frequency sinusoidal rhythm	Urgent escalation to Obstetric team (Reg / Consultant may require immediate delivery. Consider whole clinical picture CTG to continue. Consider transfer to D/Suite
10	Suspected sinusoidal rhythm	Urgent escalation to Obstetric team (Reg / Consultant may require immediate delivery. CTG to continue Consider whole clinical picture. Consider Transfer to D/suite Undertake Keilhauer to establish degree of feto-maternal haemorrhage
11	Long-term variations in high episodes below acceptable level	If accelerations present and STV normal for gestation CTG can be discontinued. Repeat within 2 Hours Inform Obstetric team of situation.
12	No accelerations	If STV is normal for gestation CTG can be discontinued. Repeat within 2 Hours Inform Obstetric team of situation.

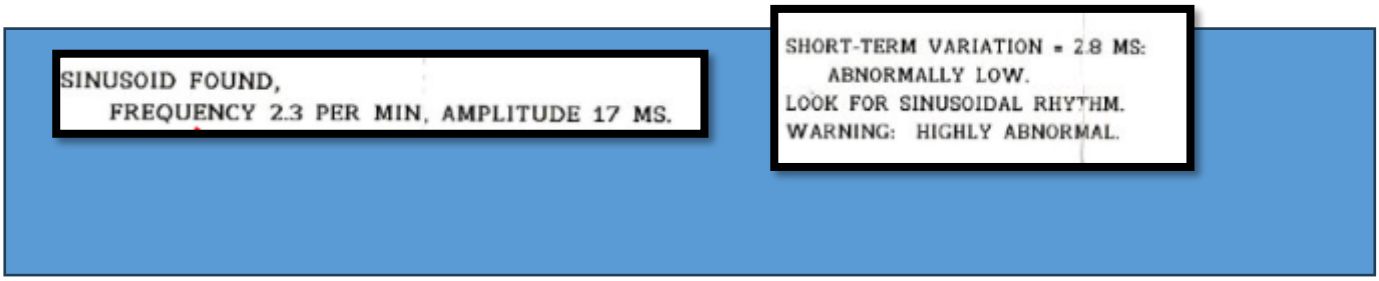
Appendix 3 Short Term Variation

Short-term variation: Interpretation of short-term variation (STV) is only valid with a full 60 minutes of data. Low STV is the best predictor of fetal acidaemia. It correlates with the development of metabolic acidaemia and intrauterine death as follows: At any stage, with any CTG If the STV falls into the borderline parameters, the CTG to continue to establish a second 60 min STV trend. If the STV falls into the high risk / concerning range, delivery to be considered with the whole clinical picture**.**

Gestational Age	Expected / Reassuring STV	Borderline STV Reset Dawes Redman Analysis and continue CTG	High-Risk / Concerning STV Plan for urgent delivery.
26–28+6 Weeks	≥ 4.0	2.8–3.9	< 2.8
29 – 31+6 Weeks	≥ 4.0	3.0–3.9	< 3.0
32–33+6 Weeks	≥ 4.0	3.2–3.9	< 3.5
34+ Weeks	≥ 4.0	3.5–4.0	< 3.5

STV (msec)	% likelihood of metabolic academia/IUD
More than 4	0
3.5-4	8
3-3.5	29
2.5-3.0	33
Less than 2.5	72

Appendix 4 Example of Waning alerts



Appendix 5 Antenatal CTG Flow chart

Antenatal CTG Dawes Redman Criteria Flow chart

CTG Dawes Redman Criteria Met

Yes

Review Risks and if required Obstetric review and plan

No

Reference the Dawes Redman report, for reasons not met to the code / management.
Escalate to obstetric team according to the management of the not meeting code. 2 Hours maximum.

Repeat CTG using the Dawes Redman analysis if remains still appropriate to use
CTG MUST run for FULL 60 Mins unless urgent delivery is indicated

CTG Dawes Redman Criteria Met (2nd CTG)

Yes

Obstetric review for plan of care to be made.

No

- ♦ Look at reason as to why it has NOT Met for a second time – Admission recommended!
- ♦ Review whole clinical picture are there any concerns
- ♦ Compare to other CTG's if possible and STV trends
- ♦ Undertaken a minimum of BD CTG's of a FULL 60 Mins (Unless delivery indicated) to ascertain true STV until USS has been performed.
- ♦ Arrange, Growth, doppler and Liquor Volume USS asap.

Consider if steroids maybe appropriate.

Once USS performed Review Finding's

If USS Normal.
No other concerns.
Daily CTG for 3 consecutive days.
Repeat Growth scan in 2 weeks (ideally consultant clinic)
If all within normal limits return to Original Pathway

If Abnormal USS or additional concerns.
(To Maternity Triage Unit @ WRH if outpatient)
Commence CTG whilst awaiting review
Urgent SNR Obstetric review.
Discuss with Fetal Medicine for advice / guidance (if appropriate).
Unless immediate delivery is required.

References

Chandraharan E (ed) (2017) Handbook of CTG Interpretation.*Cambridge University Press.*

NICE (2022) Fetal Monitoring During Labour Available: Overview | Fetal monitoring in labour | Guidance | NICE *National Guideline 229*.

NMC London (2015) The Code. *Nursing and Midwifery Council: London*

Saving Babies Lives Care Bundle Version 2 (2019) NHS England (Online: available at https://www.england.nhs.uk/wp-content/uploads/2019/07/saving-babies-livescare-bundle-version-twov5.pdf

Wretler, S. Holzeman, M. Graner, S. Lindqvist, P. Falk, S. Nordstrom, L. (2016) Fetal heart rate monitoring of short term variation (STV): a methodological observational study. [Online] *Available at: https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-016-0845-8 BMC Pregnancy and Childbirth 16:55*

Monitoring

Page/ Section of Key Document	Key control:	Checks to be carried out to confirm compliance with the Policy:	How often the check will be carried out:	Responsible for carrying out the check:	Results of check reported to: *(Responsible for also ensuring actions are developed to address any areas of non-compliance)*	Frequency of reporting:
	WHAT?	**HOW?**	**WHEN?**	**WHO?**	**WHERE?**	**WHEN?**
	CTG Not met criteria	Notes Audit	Monthly	Fetal Monitoring Lead MW	M&N	Adhoc