

## 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(s)

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This is the most current document and should be used until a revised version is in place

#### Key amendments to this guideline

Date	Amendment	Approved by:
July 2021	New document approved	Maternity Governance Meeting
July 2023	Review in line with new NICE guidance	MGM
June 2024	Updates including move to CTG from 26 weeks for RFM	MGM

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## **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 hand held 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 fetuses 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

NST – Non-Stress Test

STV- Short term variation

## **Indications for Antenatal CEFM 28+ Weeks Gestation (unless indicated otherwise below)**

- Reduced Fetal movements (RFM) - **26+ Weeks Gestation.**
- Intrauterine Fetal growth restriction (IUGR)
- Antepartum haemorrhage (APH)
- Abdominal pain/ suspected abruption
- Hypertension or pre-eclampsia
- Maternal accident or trauma to abdomen
- Poor obstetric history
- 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.

An auscultation of Fetal heart should be undertaken with either a Sonicaid or Pinards for at least 60 seconds prior to commencing the CTG. Maternal pulse should be palpated simultaneously to confirm FH has been located.

A CTG should not be interpreted in isolation, the clinical situation must always be considered, considering risk factors and examination findings.

### **Parameters**

For a reassuring Antenatal CTG trace:

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

**All 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, 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 28 weeks gestation a CTG should not be performed without a documented care plan from a senior obstetrician, except in the incidence of reduced fetal movements where the recommendation is to perform CTG after 26 Weeks gestation.

If between 26+0 -27+6 another antenatal issue arises, or labour is suspected, the commencing of a CTG in these circumstances should only be undertaken following a Senior Obstetric review.

An auscultation of Fetal heart should be undertaken with either a Sonicaid or Pinards for at least 60 seconds prior to commencing the CTG. Maternal pulse should be palpated simultaneously to confirm FH has been located.

**NOTE: A CTG undertaken before 30 Weeks Gestation should be interpreted with caution as the autonomic nervous system is not mature and therefore the presentation expected of the Fetal Heart Rate at these gestations may vary including:**

- A physiologically higher Baseline
- A Lack of accelerations
- Lower Variability
- Occurrence of sporadic decelerations.

*(Nicolaidis et al, 1989).*

**Therefore, CTG between 26 -28 weeks for RFM should only be performed using NST interpretation.**

### **Computerised CTG**

Computerised CTG – Dawes Redman Criteria / Non – Stress test (NST) is an expert assistant for CTG interpretation however the final clinical judgement should be based on the entire clinical assessment.

Normality is determined by several criteria set within the Computerised CTG system with the minimum duration of trace set at 10 minutes. If, however, criteria has not been met by the end of one hour (60 minutes) the trace would end that the criteria had not been met. The Computerised CTG analysis should be used for all antenatal CTG's over 28 weeks gestation or over 26 Weeks gestation if Reduced Fetal Movement is the only concern and must **NOT** be used for intrapartum CTG analysis or induction of labour if there is uterine activity.

Computerised CTG criteria takes into account 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 taking into account:

- 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 and perform 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 Sonicaid 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.

Note: The Fetal Heart rate varies with vagal and sympathetic tone adjustments and therefore varies with gestation age to the rate at which the Fetal Nervous System matures.

There is an increased possibility of signal loss and poor quality CTG performed prior to 30 Weeks Gestation, it is therefore recommended that every effort is made to ensure good quality of CTG to aid interpretation.

### Meeting Computerised CTG criteria

The Computerised CTG monitor will report 'Criteria Not Met' when there is insufficient evidence of normality, the monitoring should be continued. If the criteria is not met at 60 minutes, the reasons will be listed numerically on the printout (Appendix 1). See appendix 2 for management algorithm.

Short term variation (STV) is a predictor of Fetal well-being (Appendix 3) however is not the only predictor and the whole clinical picture should be considered. STV is not calculated until 60 minutes and therefore providing the CTG is **NOT** pathological, Computerised CTG should be left for the full 60 minutes if not meeting criteria in order to calculate the STV correctly. If the CTG is Pathological, there should be **NO** delay and Obstetric team to review immediately. If the criteria is not met after 60 minutes, the action depends on the STV, gestation, whether or not a sinusoidal rhythm is present and the presence of Fetal movements.

- If STV is  $>4.0$  the Fetus is unlikely to be hypoxemic and other clinical aspects of the case should be considered.
- If STV is between 3.0 and 3.99 repeat the CTG in 2 hours and notify Obstetric team (if at Kidderminster or Redditch, transfer to Worcester). Ultrasound scan for growth, liquor volume and Doppler may be indicated. CTG should continue if there are any other concerning factors.
- If STV is  $<3.0$ , this is a pre-terminal trace and the Obstetric team should be notified immediately and the patient should be prepared for delivery. With an STV of  $<3$ , there is a high probability of metabolic acidosis and asphyxia. For patients in Kidderminster or Redditch, a call to 999 should be made and a request for a "time critical ambulance transfer".
- If a sinusoidal rhythm is present, notify Senior Registrar or Obstetric Consultant urgently.

The CTG monitoring can be discontinued once the Computerised CTG criteria are met, and plan of care followed.

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 continue for 20-40 minutes and providing good variability, present accelerations, a normal stable baseline, and no decelerations, the CTG may be deemed normal and discontinued; this should be agreed and signed by 2 registered midwives and documented clearly in the notes. (See appendix 4). If the CTG has any abnormal features, an urgent review by Senior Registrar or Obstetric Consultant is required.

**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 guideline should be followed.

Daily CTG	Twice daily CTG
Routine post-dates induction of labour	Growth <10 <sup>th</sup> centile/Static growth on USS
Diet control GDM with normal size baby	Preterm <37/40
Maternal request	Elevated PI but normal EDF
Pelvic girdle dysfunction	Reduced Fetal movements (> 26 Weeks Gestation)
Large for dates	PET/PIH
Polyhydramnios	SROM <37/40
Maternal Age	Oligohydramnios
	DCDA twins
	Diabetics on metformin or insulin
	Obstetric Cholestasis
	History of Antepartum haemorrhage resulting in decision for IOL– not actively bleeding

**If abnormal results are found between 26-27+6 Weeks Gestation on the CTG assessment for Reduced Fetal Movement, an urgent review should be undertaken by a Senior Obstetrician. Care Planning will include the family and should consider the most appropriate location for further care if appropriate. Consideration should be given to appropriate neonatal facilities and if they will be required, this will require liaison with the neonatal team in the early stages of care planning.**

**Possible error at end of the record**

This occurs when the machine detects a possible abnormality at the end of the trace which would otherwise be passed as criteria met.

In this event the trace should be continued or acted upon appropriately regards to the clinical evaluation.

**High frequency sinusoidal rhythm**

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.

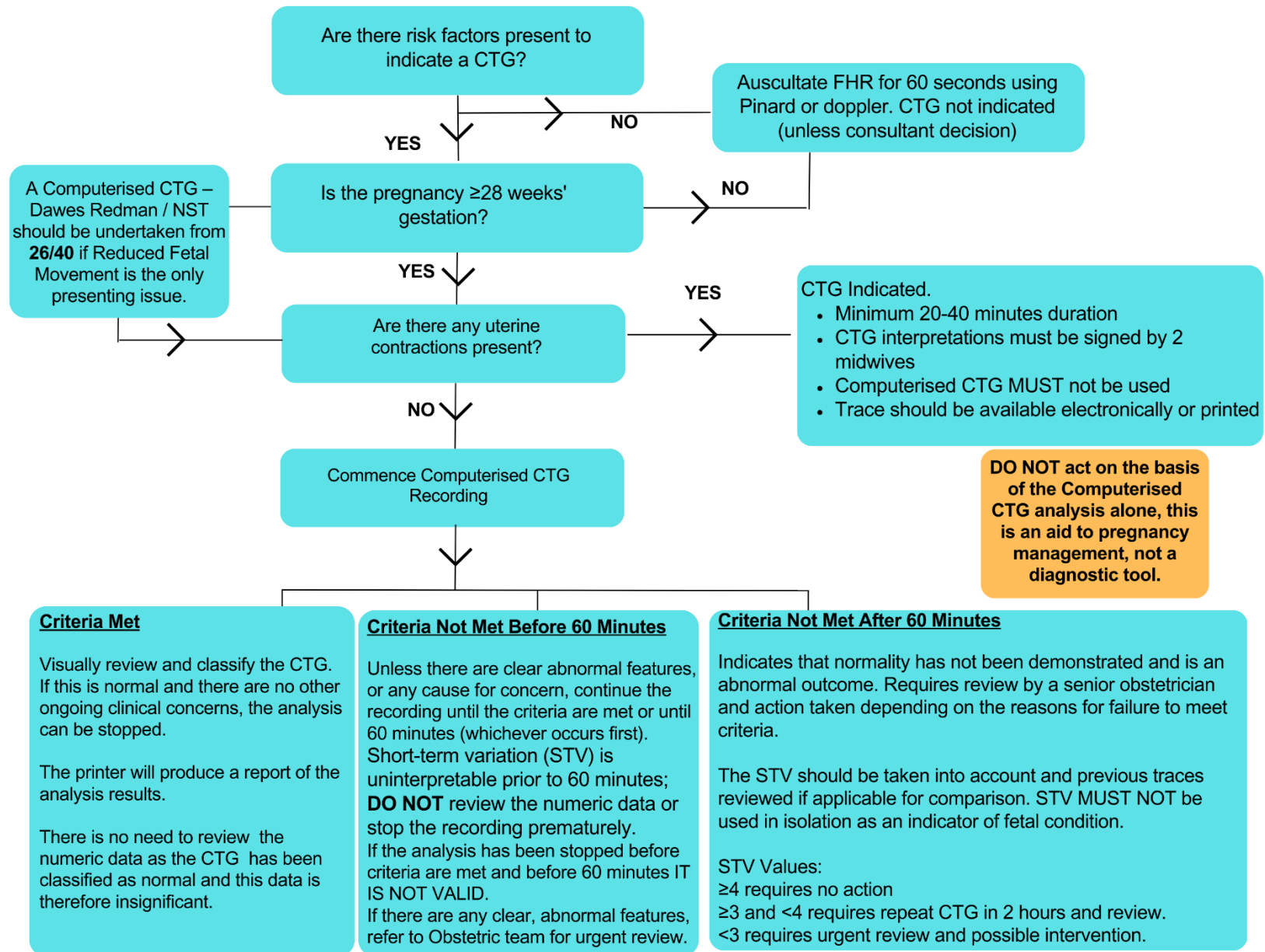
**No accelerations**

If no accelerations are present in an antenatal CTG, the trace should be continued and be reviewed by a senior registrar or Obstetric consultant. (Computerised CTG analyses uses a lower threshold of >10bpm for an acceleration compared to NICE definitions).

Appendix 1: Computerised CTG Numerical Codes

Code	Reason criteria not met
1	Basal heart rate outside normal range
2	Large decelerations
3	No episodes of high variation
4	No movements and fewer than 3 accelerations
5	Baseline fitting is uncertain
6	Short-term variation is less than 3ms
7	Possible error at the end of the record
8	Decelerations at the end of the record
9	High-frequency sinusoidal rhythm
10	Suspected sinusoidal rhythm
11	Long-term variations in high episodes below acceptable level
12	No accelerations





### 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:

STV (msecs)	Gestation	% likelihood of metabolic acidaemia	% likelihood of IUD
<2.6	25-38	10.3%	24.1%
2.6-3.0	26-38	4.3%	4.3%
>3	27-37	2.7%	0.0%

## References

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