

# Labour: Cardiotocograph (CTG) Interpretation and Response

## 1. Purpose

Cardiotocography (CTG) or electronic fetal monitoring (EFM) is the most widely used technique for assessing fetal wellbeing in labour in the developed world. The primary purpose of fetal surveillance by CTG is to prevent adverse fetal outcomes<sup>2</sup>.

This document provides guidelines for clinicians in CTG interpretation and response to the CTG pattern by defining a standardized process of interpretation, documentation and management of cardiotocographs (CTG), in particular where variations from 'normal' occur.

CTGs have a high degree of sensitivity but a low level of specificity which means that they are very good at telling us which fetuses are well but are poor at identifying which fetuses are unwell. The differences in individual fetal responses to a decrease in oxygen (and therefore differences in heart rate changes) mean that the positive predictive value of CTG for adverse outcome is low and the negative predictive value high. The increased intervention rates associated with EFM can be reduced with the use of fetal blood sampling (FBS). This guideline can be used in conjunction with the guideline [CPG Fetal Blood Sampling](#).

## 2. Definitions

**Baseline fetal heart rate (FHR)** is the mean level of the FHR when this is stable, excluding accelerations and decelerations. It is determined over a time period of 5-10 minutes, expressed as beats per minute (bpm)<sup>1</sup>. Preterm fetuses tend to have values towards the upper end of the normal range.

**Baseline variability** is the minor fluctuation in baseline FHR. It is assessed by estimating the difference in bpm between the highest peak and lowest trough of fluctuation in one minute segments of the trace<sup>1</sup>.

**Accelerations** are transient increases in FHR of 15bpm or more above the baseline and lasting 15 seconds. Accelerations in preterm fetuses may be of lesser amplitude and shorter duration<sup>1</sup>.

**Decelerations** are transient episodes of decrease of FHR below the baseline of more than 15 bpm lasting at least 15 seconds. The specific features of the deceleration inform the classification.

*NB: late decelerations can be less than 15 beats from the baseline- see below\*.*

- **Early decelerations** are usually benign and associated with the sleep cycle and often in the range of 4-8 cm of cervical dilatation. They are caused by head compression and in general are a normal physiological response to a mild increase in intracranial pressure. Importantly they are uniform in shape and start and finish with the contraction. They may be said to mirror the contraction<sup>2</sup>.
- **Variable decelerations** are a repetitive or intermittent decreasing of FHR with rapid onset and recovery. Time relationships with contraction cycle may be variable but most commonly occur simultaneously with contractions<sup>1</sup>. The significance of variable decelerations depends on the overall clinical picture and specific features of the decelerations themselves, as well as other features of the CTG<sup>2</sup>. Variable decelerations in association with other non-reassuring or abnormal features change the category of the deceleration to 'complicated'.
- **Complicated variable decelerations** are defined by their features as well as the other features of the CTG. These additional features indicate the likelihood of fetal hypoxia and the definition includes one or more of the following:
  - Rising baseline rate or fetal tachycardia
  - Reduced or absent baseline variability
  - Slow return to baseline FHR after the end of the contraction
  - Onset of the nadir after the peak of the contraction

- Large amplitude (by 60bpm or to 60bpm) and /or long duration (60 seconds)
- Loss of pre and post deceleration shouldering (abrupt brief increases in FHR baseline).
- Presence of post deceleration smooth overshoots (temporary increase in FHR above baseline)<sup>1</sup>
- **Prolonged decelerations** are defined as a decrease of FHR below the baseline of more than 15 bpm for longer than 90 seconds but less than 5 minutes<sup>1</sup>.
- **Late decelerations** are defined as uniform, repetitive decreasing of FHR with, usually, slow onset mid to end of the contraction and nadir more than 20 seconds after the peak of the contraction and ending after the contraction<sup>1</sup>. Late decelerations are caused by contractions in the presence of hypoxia. This means that they will occur with each contraction and the fetus is already hypoxic. There will be no features of a well oxygenated fetus, like early or typical variable decelerations, normal baseline variability or shouldering. They start after the start of the contraction and the bottom of the deceleration is more than 20 seconds after the peak of the contraction. Importantly, they return to the baseline after the contraction has finished. In the hypoxic fetus, this will include decelerations of less than 15bpm (and occasionally less than 5bpm)\*.

**A sinusoidal pattern** is an oscillating pattern which is typically **smooth and regular**. It has a relatively fixed period of 2-5 cycles per minute and has an amplitude of between 5 and 15 bpm around the baseline rate. Baseline variability is absent and there are no accelerations. It is typically reflective of severe anaemia, with haemoglobin levels below 50 gm/L <sup>2</sup>.

**The pseudo sinusoidal pattern** is a false sinusoidal pattern. While it may on outward appearance share some features of the sinusoidal pattern, it is not as smooth and is not regular. The hallmark feature of a pseudo sinusoidal trace is the appearance of some period of normal baseline variability and accelerations. This pattern is not typically associated with fetal compromise and biophysical assessment will reflect this <sup>2</sup>.

### **Classification of CTGs**

**Normal antenatal** CTG trace: The normal antenatal CTG is associated with a low probability of fetal compromise and has the following features:

- Baseline fetal heart rate (FHR) is between 110-160 bpm
- Variability of FHR is between 5-25 bpm
- Decelerations are absent or early
- Accelerations x2 within 20 minutes.

**Normal intrapartum** CTG trace: The normal intrapartum CTG is associated with a low probability of fetal compromise and has the following features:

- Baseline FHR is between 110-160 bpm
- Variability of FHR is between 5-25 bpm
- Decelerations are absent or early
- The significance of the presence or absence of accelerations is unclear. Therefore, exclude accelerations during interpretation.

**Non-reassuring** CTG trace is where one of the following features is present; these are unlikely to be associated with significant fetal compromise when occurring in isolation:

- Baseline FHR is between 100-109 bpm or between 161-170 bpm
- Variability of FHR is reduced (3-5 bpm for >40 minutes)
- Decelerations are variable without complicating features
- Do not consider the absence of accelerations in intrapartum interpretation as abnormal.

**The presence of two or more features is considered abnormal** as these may be associated with fetal compromise and require further action.

**Abnormal** CTG trace is where two of the features described in non-reassuring CTG trace are present OR one or more of the following features; these are very likely to be associated with significant fetal compromise and require further action.

- Baseline FHR is <100 bpm or >170 bpm
- Variability is absent or <3 bpm
- Variability is sinusoidal
- Decelerations are prolonged for >3 minutes / late / have complicated variables

### 3. Responsibilities

Medical and midwifery staff are responsible for decision-making regarding identification of women and babies who require electronic fetal monitoring, for the interpretation of the CTG with regard to the total clinical picture and for the clinical management response to the CTG interpretation. Clinical staff involved in assessing fetal well-being are expected to ensure regular professional development activities with this important clinical skill on an annual basis.

At the Women's all clinical staff involved in fetal assessment using CTG are required to attend annual CTG education.

### 4. Guideline

#### Antenatal risk factors<sup>1</sup>

- Abnormal antenatal CTG
- Abnormal Doppler umbilical artery velocimetry
- Suspected or confirmed intrauterine growth restriction
- Oligohydramnios or polyhydramnios
- Prolonged pregnancy >42 weeks gestation
- Multiple pregnancy
- Breech presentation
- Antepartum haemorrhage
- Prolonged rupture of membranes (>24 hours)
- Known fetal abnormality which requires monitoring
- Prior uterine scar / caesarean section
- Pre-eclampsia
- Diabetes (on insulin or poorly controlled or with fetal macrosomia)
- Other current or previous obstetric or medical conditions which constitute a significant risk of fetal compromise

#### Intrapartum risk factors<sup>1</sup>

- Induction of labour with prostaglandin / oxytocin
- Abnormal auscultation or CTG
- Oxytocin augmentation
- Epidural analgesia
- Abnormal vaginal bleeding in labour
- Maternal pyrexia
- Meconium or blood stained liquor
- Absent liquor following amniotomy
- Active first stage of labour >12 hours (i.e. regular uterine activity cervix 4cm dilated)
- Active second stage (i.e. pushing) >1 hour where delivery is not imminent

- Preterm labour less than 37 completed weeks<sup>1</sup>

### Assessment

- Determine indication for fetal monitoring (see indications listed above)
- Discuss fetal monitoring with the woman and obtain permission to commence<sup>1</sup>
- Perform abdominal examination to determine lie and presentation
- Give the woman the opportunity to empty her bladder
- The woman should be in an upright or lateral position (not supine)
- Check the accurate date and time has been set on the CTG machine, and paper speed is set at 1cm per minute<sup>1</sup>
  - If using the electronic CTG archiving system check that the date and time on the computer is correct
- CTGs must be labelled with the mother's name, UR number and date / time of commencement
  - If using the electronic CTG archiving system check that the correct woman's record is in the correct bed on the whiteboard. This will ensure that the CTG is saved to the correct electronic record.
- Maternal heart rate must be recorded on the CTG at commencement of the CTG in order to differentiate between maternal and fetal heart rates.
  - If using the electronic CTG archiving system, this can be done by accessing the menu and documenting in the 'maternal heart rate' box which can be found under the 'observations' tab

### Interpretation and documentation

- CTG interpretation should follow a standardized process to ensure all features of the CTG are documented.
  - If using the electronic CTG archiving system use the standardized menu to describe the features and response
- On all occasions when a CTG is performed there must be documentation of all features in the woman record.
  - If using the electronic CTG archiving system, use the options on the tabs in the menu
- For women receiving continuous electronic fetal monitoring (EFM) the CTG should be reviewed at least every 15 to 30 minutes<sup>1</sup>. This can be achieved by initialing the CTG at regular intervals as evidence of the review.
  - On the electronic record, logging in and choosing the clinician type from the menu is sufficient to create an electronic signature.
- Interpretation and response to findings must be documented on an hourly basis.

**Response to the CTG** trace should be guided by the algorithm (below), and any abnormalities documented in the woman's record and reported to (escalate in light of the woman's clinical circumstances):

- The senior midwife in Birth Centre and / or
- The registrar rostered to Birth Centre and / or
- The consultant obstetrician rostered to Birth Centre

## 5. Evaluation, monitoring and reporting of compliance to this guideline or procedure

Compliance to this guideline or procedure will be monitored, evaluated and reported through review of incidents reported on VHIMS.

## 6. References (evidence, best practice, professional codes, websites, etc.)

1. The Royal Australian and New Zealand College of Obstetricians and Gynaecologists (2006) Intrapartum Fetal Surveillance Clinical Guidelines.

2. Baker L, Beaves M, Trickey D and Wallace E. 2009. Fetal Surveillance: A Practical Guide. Southern Health and RANZCOG

## **7. Legislation related to this guideline or procedure**

Not applicable

## **8. Keywords or tags**

Cardiotocograph, fetal monitoring, antenatal, intrapartum, decelerations, non-reassuring, abnormal, normal, baseline, accelerations, late decelerations, early decelerations, variable decelerations, algorithm, fetal distress, fetal compromise, RANZCOG guidelines, lactate, nadir, CTG archiving, complicated variables

## **9. Appendices**

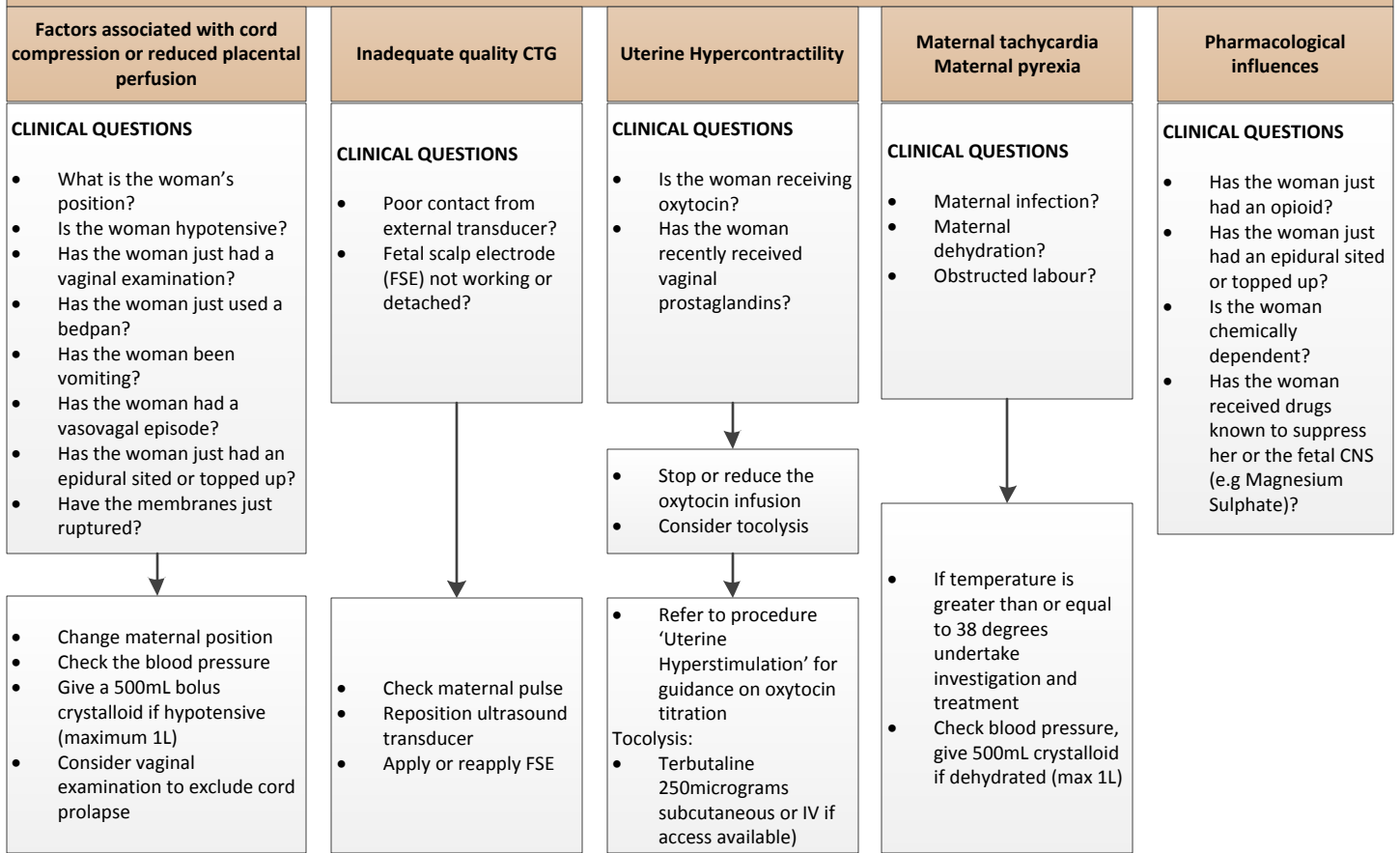
CTG Interpretation and response algorithm.

# The Women's CPG: Algorithm: Cardiotocograph (CTG) interpretation and action (Oct 2011)

	Normal	Non-reassuring	Abnormal
<b>Baseline</b>	110-160	100-109 161-170	Less than 100 Greater than 170
<b>Variability</b>	5-25bpm	3-5bpm for >40 minutes >25bpm for >40 minutes	Absent <3bpm Sinusoidal pattern
<b>Decelerations</b>	None Early decelerations	Variable decelerations	Complicated variable decelerations Prolonged decelerations > 3minutes Late decelerations
<b>Accelerations</b>	2 present in 20 minutes	Do not consider the presence or absence of accelerations in the intrapartum interpretation as being abnormal	

The full clinical picture must always be considered when interpreting fetal heart rate patterns

## Non-reassuring CTG



## Abnormal CTG

