

FETAL HEART MONITORING

DEFINITION

The aim of fetal heart monitoring is to prevent adverse perinatal outcomes by identifying fetuses with metabolic acidosis/cerebral hypoxia at a point when the process is reversible by appropriate intervention.

Fetal heart rate monitoring can be performed by regular auscultation with a fetoscope, Pinard or hand-held Doppler (Intermittent Auscultation (IA)) or by continuous electronic fetal monitoring (EFM) by cardiotocograph (CTG).

ANTENATAL ELECTRONIC FETAL MONITORING

There is no evidence to support the routine antenatal use of EFM for fetal assessment in women with an uncomplicated pregnancy.¹

For women at increased risk of pregnancy complications current evidence has not identified differences in outcomes with the use of EFM during pregnancy, but more studies are needed.¹

There is no evidence to support EFM prior to 28 weeks gestation. Any decision to perform this level of monitoring at earlier gestation should be discussed with the Obstetric consultant and justification documented.

Any decision to perform EFM to assess fetal wellbeing between 28-37 weeks of gestation will be based on clinical indication and should be discussed with the Obstetric team.

EFM is not appropriate in any case of suspected intrauterine fetal demise, ultrasound scan is recommended as the initial investigation.

Interpretation of antenatal EFM is the same as intrapartum with the added considerations of:

- An isolated small variable deceleration is not usually significant on an antenatal CTG if the remainder of the CTG is normal. However, all decelerations on an antenatal CTG require obstetric review.
- Most decreased baseline variability is due to normal fetal sleep. If decreased variability continues for more than 40 minutes, in spite of manoeuvres to encourage fetal movements, obstetric review is required.
- During electronic fetal monitoring it is recommended the hand held patient event marker is used by the woman to clearly determine fetal movements. The automatic fetal movement detector (FMD or Actogram) is not a reliable method for detecting fetal movement as it can be triggered by low velocity movement.

USE OF ANTENATAL EFM IN A PRIMARY UNIT (REFER APPENDIX 3)

Primary units offering antenatal EFM for rural women, provide this service for the following:

- Reduced fetal movements on first presentation **only**.
- As indicated by the obstetric team following consultation with Christchurch Women's Maternity Outpatient Department. Any concerns please fax to Day Assessment Unit (DAU) at 03 364 4471.

USE OF INTRAPARTUM EFM IN A PRIMARY UNIT

This is not recommended or supported.

INTERMITTENT AUSCULTATION

(Refer to algorithm in Appendix 1 for suitability for intermittent auscultation.)

Intermittent auscultation is a listening and counting method and the fetal heart rate should be documented as a single number (like documentation of maternal pulse rate) instead of a range. The terminology used around IA is different from that used for CTG's as there is not a printed trace to interpret.³

Initial assessment to include:³

- **Risk factors** for increased fetal compromise (refer to Appendix 1)
- **Abdominal palpation** to assess lie, presentation, position, descent, growth and liquor volume, including plotting fundal height on a customised G.R.O.W. chart
- Usual pattern of **fetal movements**
- Assessment of **uterine activity** – frequency, length, strength, resting tone, uterine irritability and tenderness
- **Average fetal heart rate** – determined by listening toward the end of a contraction, in the absence of fetal movements, and counting for 30-60 seconds on several occasions.
- **Maternal pulse** – recorded to distinguish from fetal heart
- **Fetal heart increases** – determined by listening during a fetal movement
- **Fetal heart decreases** – these should not be audible when auscultation is performed immediately after a contraction for 60 seconds

ONGOING MONITORING USING IA

First stage of labour:

Frequency	every 15-30 minutes
Timing	commence toward the end of a contraction
Duration	and count for 30-60 seconds after

Second stage of labour:

Frequency	at least every 5 minutes or after each contraction
Timing	from the end of a contraction
Duration	count for 30-60 seconds

IA INTERPRETATION

Normal findings:	Fetal heart rate between 110-160 bpm Fetal heart increases above the average No fetal heart decreases below the average Regular rhythm
Abnormal findings:	Tachycardia (> 160 bpm) Bradycardia (< 110 bpm) Gradual or abrupt decreases in fetal heart Changes to rhythm (irregular)

CONTINUOUS EFM

A number of antenatal and intrapartum risk factors have been shown to be associated with adverse perinatal outcomes (see algorithm Appendix 1). In the presence of any of these risk factors, continuous EFM should be recommended.

Where continuous EFM is required for the substantial part of labour, and if the EFM to date is considered normal, monitoring may be interrupted for short periods of up to 15 minutes to allow for personal care (eg. toilet or shower). Such interruptions should be infrequent and not occur following any intervention that might be expected to alter the fetal heart rate (eg. medication administration, rupture of membranes). The RANZCOG Intrapartum fetal surveillance guidelines (2014) suggest EFM may be used continuously or intermittently. The CDHB do not support intermittent EFM.

Intrapartum fetal surveillance and its interpretation is a complex task which requires a sound understanding of fetal physiological responses to hypoxia, good pattern recognition skills and the ability to integrate this knowledge with each clinical situation. Health professionals involved in intrapartum care have a responsibility to access regular training in intrapartum fetal surveillance (see below for training recommendations). The summary of fetal heart rate patterns provided below is to be used in addition to, rather than instead of, an understanding of fundamental physiology.

NORMAL CTG

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

- Baseline rate 110-160 bpm
- Baseline variability of 6-25 bpm
- Accelerations 15 bpm for 15 seconds
- No decelerations

ABNORMAL CTG

All other CTGs are by this definition **abnormal** and require further evaluation taking into account the *full clinical picture*.

The following features are *unlikely* to be associated with significant compromise *when occurring in isolation*:

- Baseline rate 100-109 bpm
- Absence of accelerations
- Early decelerations
- Variable decelerations without complicating features

The following features may be associated with significant fetal compromise and *require further action including consultation (Refer to page 30 RANZCOG (2014) Intrapartum fetal surveillance Clinical Guidelines – third edition)*:

- Fetal tachycardia > 160 bpm
- Reduced baseline variability 3-5 bpm
- Rising baseline fetal heart rate
- Complicated variable decelerations
- Late decelerations
- Prolonged decelerations
- Rising baseline FHR

The following features are *very likely* to be associated with significant fetal compromise and *require immediate action*, which may include urgent delivery:

- Prolonged bradycardia (< 100 bpm for > 5 mins)
- Absent baseline variability
- Sinusoidal pattern
- Complicated variable deceleration with reduced or absent baseline variability
- Late decelerations with reduced or absent baseline variability

CORDLESS FETAL TRANSDUCERS

EFM can be performed using cordless transducers via radio wave telemetry giving women freedom of movement while being monitored. In the event of technical issues with the wireless signal reception, standard wired monitoring should be resumed.⁴

The following requirements should be met prior to making the decision for cordless monitoring:

- Health professionals using this equipment must be familiar with instructions for use (DVD and booklet available from Birthing Suite Clinical Coordinators or Midwifery Educators).
- Use of cordless monitoring will generally be most appropriate for women birthing after a caesarean section and will be decided on a case by case basis as discussed with birthing suite clinical coordinator or obstetric team.
- A minimum period of standard wired EFM is required to confirm fetal well-being before commencement of cordless EFM, including maternal pulse oximetry, to ensure accurate cordless monitoring.

- If a woman is mobilising during EFM, the chance of losing the signal or detecting the maternal heart rate is higher than for standard wired EFM, and requires extra vigilance from health professionals around regular checking of maternal heart rate and position of transducers. Ensure that women stay within range of the base unit, ie. the same corridor as her room.
- Cordless transducers may be used while woman is in birthing pools.
- Use of the 'MONICA' cordless GTG
 - Generally most appropriate for women with an increased BMI and for whom continuous fetal monitoring is difficult due to maternal habitus. Use is decided on a case by case basis.
 - Health professionals using the MONICA need to be familiar with its use, including the skin preparation.
 - Extra vigilance required from health professionals around regular checking of maternal heart rate and position of transducers
 - MONICA must NOT be used in water or with multiple pregnancies.
 - Changing the ECG electrodes is necessary every 24 hours. Observe for skin irritation.

MANAGEMENT OF ABNORMAL FETAL HEART RATE

In clinical situations where the fetal heart rate pattern is considered abnormal, whether using IA or continuous EFM, correct action includes:

- Checking maternal **pulse**/attach maternal probe
- Checking **positioning of CTG** transducer
- Maternal **position change** to increase utero-placental perfusion and/or alleviate cord compression
- Continuing or commencing **continuous EFM**
- Identification of any **reversible cause** of the abnormality and initiation of appropriate action (eg. correction of maternal hypotension, cessation of oxytocin infusion* and/or acute tocolysis for excessive uterine activity)
- Consideration of fetal blood sampling
- Escalation of care

*NOTE: In certain circumstances, oxytocin infusion may be reduced rather than discontinued, in order to maintain dose sufficient for continuing augmentation of labour but without hyperstimulation. If CTG is abnormal but unlikely to be associated with fetal compromise, the trace must be reviewed by the obstetric team prior to decision is made on continuing dose of oxytocin for augmentation.

FETAL BLOOD SAMPLING

The increased intervention rate associated with EFM can be reduced with the use of fetal blood sampling (FBS).³

Fetal blood lactate sampling is easier to perform as it requires a smaller sample size. In addition to testing fetal blood lactate it is recommended that pH is tested if sufficient blood sample is available. Lactate level gives a more direct measure of metabolic acidosis than pH, as it measures a metabolite

of anaerobic metabolism. The following are recommended actions according to lactate level and pH level.⁹

LACTATE	pH	CLASSIFICATION	ACTION
≤ 4.0	≥ 7.25	Normal	Repeat FBS only required if continued concerns about fetal wellbeing (or if CTG does not return to normal).
≥ 4.1-4.7	> 7.21-7.24	Borderline	Repeat FBS 20-30 minutes.
≥ 4.8-5.7	7.01-7.20	Indicative of fetal acidaemia	Delivery indicated by Category 2 caesarean section unless assisted vaginal birth possible or spontaneous vaginal birth imminent.
≥ 5.8	< 7.0	Abnormal	Requires urgent assisted vaginal delivery if possible or a category 1 caesarean section.

As an adjunct to CTG monitoring in the active phase of labour, fetal blood sampling (FBS) for scalp pH and/or lactate should be considered in all circumstances where the CTG is non-reassuring.

INDICATIONS TO PERFORM FBS INCLUDE

(Refer to page 34 RANZCOG (2014) *Intrapartum Fetal Surveillance Clinical Guidelines – third edition*)

- Abnormal trace with no reassuring features + clinical picture. If normal variability – no need to do FBS
- Persistent variable or late decelerations – if chronic late decelerations do not waste time doing FBS
- Unexplained decrease in variability – look for other reassuring features. Why is there reduced variability?
- Unexplained tachycardia
- Sinusoidal pattern – don't waste time – Category 1 LSCS
- Prior to trial of assisted delivery where the CTG is suspicious or pathological (see comments below regarding fetal blood sampling at full dilatation)

Caution with FBS should be exercised with:

- Maternal Pyrexia
- Evidence of maternal sepsis
- Full dilatation – second stage is naturally accumulative of lactic acids in both mother and fetus and not necessarily associated with hypoxia.

In the presence of infection fetal condition can change rapidly. Fetal blood sampling may be of less value in the presence of pyrexia, as it assesses hypoxia/acidaemia and not sepsis. Therefore the results of fetal blood sampling, if reassuring, should be interpreted with caution.

In general it is reasonable to perform fetal blood sampling in the passive phase of second stage. In the active phase of the second stage maternal lactate rises by 2mmol/l for every 30 minutes of active pushing.⁵ The fetal lactate rises correspondingly, and may be difficult to interpret. FBS may be appropriate before a 'trial' of instrumental delivery, but if delivery is assured at a low station with OA presentation, then proceeding direct to assisted delivery without FBS may be expedient.

Where more than one sample is obtained, the 1st sample should be tested. If a result is achieved, discard all other sample(s).

CONTRA-INDICATIONS TO FBS

(Refer to page 34 RANZCOG (2014) Intrapartum Fetal Surveillance Clinical Guidelines – third edition)

- Clear evidence of serious fetal compromise e.g. prolonged fetal bradycardia where urgent birth is required/chronic hypoxic late decelerations
- Significant fetal compromise in second stage of labour where assisted vaginal birth is appropriate
- Known maternal infection, eg. HIV, hepatitis B&C viruses, active herpes simplex virus or evidence of intrauterine sepsis. Group B Streptococcus carrier status does not preclude FBS
- Prematurity < 34 weeks
- Face or uncertain presentation
- Bleeding disorder such as suspected haemophilia or known maternal autoimmune thrombocytopenia

The threshold for FBS should be reduced in the presence of other risk factors such as meconium, known IUGR or oligohydramnios. Scalp pH/lactate results should be interpreted taking into account any prior pH/lactate measurement, the rate of progress in labour and any other risk factors.

After a normal FBS result, sampling should be repeated at an interval of 40 to 60 minutes if the CTG remains non-reassuring or sooner if there are new abnormalities.

After a borderline FBS result, sampling should be repeated at an interval of 20 to 30 minutes if the CTG remains non-reassuring or sooner if there are new abnormalities.

If the CTG remains unchanged and the FBS result is unchanged at the second test, a further sample may be deferred unless additional abnormalities develop on the trace.

Where FBS sampling is considered necessary for a third separate occasion, a consultant/specialist obstetric opinion should be sought prior.

Following any labour where FBS has been performed, paired cord samples should be taken at birth to confirm acid-base status of the baby.

EXCESSIVE UTERINE ACTIVITY

IN THE ABSENCE OF FETAL HEART RATE ABNORMALITIES

In the presence of excessive uterine activity (defined as either):

- Tachysystole (more than five active labour contractions in ten minutes, without fetal heart rate abnormalities), or
- Uterine hypertonus (contractions lasting more than two minutes in duration or contractions occurring within 60 seconds of each other, without fetal heart rate abnormalities)

Appropriate management of uterine hypertonus or tachysystole should include:

- Continuous electronic fetal monitoring;
- Consider reducing or ceasing oxytocin infusion;

- Maternity staff remaining with woman until normal uterine activity is observed;
- Tocolysis may be considered.

IN THE PRESENCE OF FETAL HEART RATE ABNORMALITIES.

Appropriate management of uterine hyperstimulation should include:

- Continuous electronic fetal monitoring;
- Reducing or ceasing oxytocin infusion;
- Maternity staff remaining with the woman until normal uterine activity is observed;
- Consideration of tocolysis; before
- Consideration of urgent delivery

Maternity care providers should be familiar with and have a protocol for acute tocolysis (relevant to the level of service) in the event that uterine hyperstimulation occurs.

Tocolytic regimens available may include:

- Terbutaline, 250 micrograms subcutaneously or IV (Grade C) – on birthing suite
- GTN, 100-200 micrograms IV – in theatre

DOCUMENTATION

Both IA and continuous EFM require careful documentation. All staff asked to review a CTG must record their findings.

When using IA, the fetal heart rate is documented as a single number, ie. 136 bpm and not as a range of numbers. The timing and duration are documented as well as the equipment used to listen to the fetal heart.³

Use of the partogram is recommended during EFM and it may be useful during IA as it may provide visual clues to changes in the fetal heart rate such as a rising baseline.

WHEN COMMENCING A CTG ALWAYS

- Attach the woman's identification label to the CTG paper
- Check the time and date stamp and paper speed and sign as correct on CTG paper
- Document in the clinical record the time and date of commencement of CTG
- Document the maternal pulse on the CTG paper/ continuous maternal heart rate

WHILE CTG IS IN PROGRESS

- Record significant events on the CTG paper, eg. vaginal examinations, insertion of epidural, episodes of vomiting or hypotension, fetal blood sampling.
- Document maternal pulse on the CTG paper if there is a break in recording or if there is a sudden change in baseline rate. Use continuous maternal pulse rate monitoring where available with CTG.

- Ensure that any member of staff who is asked to provide an opinion signs the trace and **documents in the woman's clinical record the plan of care along with the date, time and signature.**
- A documented systematic assessment to be undertaken every hour or as required.
- Where there is a concern about fetal wellbeing all midwifery staff to complete the CTG sticker tool to assess the CTG features prior to requesting a review by the senior midwife, preferably in the first instance, or medical staff.
- A CTG sticker to be used by medical and midwifery staff when documenting in the clinical record. (Ref.7329)
- When a CTG is reviewed, the reviewer is to also sign the CTG sticker.

CARDIOTOCOGRAPH (CTG)				<input type="checkbox"/> Antenatal	<input type="checkbox"/> Intrapartum		
Date:	Time:	Maternal pulse:	Gestation: / 40	*Fetal movements: Y / N			
Risk	Indication for CTG:						
Contractions	None	Irregular	Regular	Mild	Moderate	Strong in 10 min
Baseline rate	110 - 160	100 - 109			> 160	< 100 bpm for > 5 mins	
..... bpm							
Variability	6 - 25 bpm			Reduced (3-5 bpm)		Absent (< 3 bpm)	
Accelerations	Present	Absent					
Decelerations	1. None	1. Early 2. Variable without complicating features		1. Complicated variable 2. Late 3. Prolonged (> 90 secs but < 5 mins)		1. Bradycardia > 5 mins 2. Complicated variable with reduced variability 3. Late with reduced variability 4. Sinusoidal	
Overall assessment	NORMAL	ABNORMAL <u>Unlikely</u> associated with significant fetal compromise		MORE ABNORMAL <u>Maybe</u> associated with significant fetal compromise		VERY ABNORMAL <u>Very likely</u> associated with significant fetal compromise	
Action	No action required	<input type="checkbox"/> Correct reversible causes* <input type="checkbox"/> Second opinion		<input type="checkbox"/> Correct reversible causes* <input type="checkbox"/> Urgent referral to senior colleague			
Plan	(eg. FBS, tocolysis, continue CTG)						
Print Name 1:				Signature:			
Print Name 2:				Signature:			
Ref.7329	Authorised: CMM B/S	Feb 2018	*Refer to CDHB Maternity Guideline 'Fetal Heart Monitoring'				

NOTE: *CTG sticker to be used in conjunction with this guideline and training programme as described below, (eg. indications for CTG listed in Appendix 1, action for correction of reversible causes summarised above in 'Management of Abnormal Fetal Heart Rate').

AT COMPLETION OF CTG

- Following birth, sign the CTG paper and note the date, time and mode of birth.
- Store CTG paper securely with the woman's clinical record at the end of the monitoring process.
- Multiple CTG's need to be numbered in chronological order.

EDUCATION AND TRAINING

It is acknowledged that these guidelines need to be complemented by a comprehensive and ongoing education and training programme. CDHB have provided the K2 online fetal monitoring programme since May 2007 and, from 2012 have also provided access to training as part of the RANZCOG fetal surveillance education programme (FSEP). The current CDHB version of the K2 fetal monitoring programme is in line with RANZCOG fetal monitoring recommendations (from January 2013).

Fetal monitoring training is mandatory for all CDHB health professionals undertaking any aspect of EFM, and is a strong recommendation for all self-employed Lead Maternity Carers (LMC's).

The training consists of:

- Completion of K2 fetal monitoring package or RANZCOG online FSEP programme (contact O&G education supervisors or midwifery educators for most appropriate option)
- RANZCOG FSEP Full day
- RANZCOG FSEP Half day refresher

The cycle is repeated every 3 years, in any order but with the full day workshop being completed prior to the half day refresher. A CDHB staff member with a score below 55% in their FSEP assessment requires an individual learning/supervision plan developed with their line manager and/or educator training supervisor within 3 months and re-assessment within 6 months.

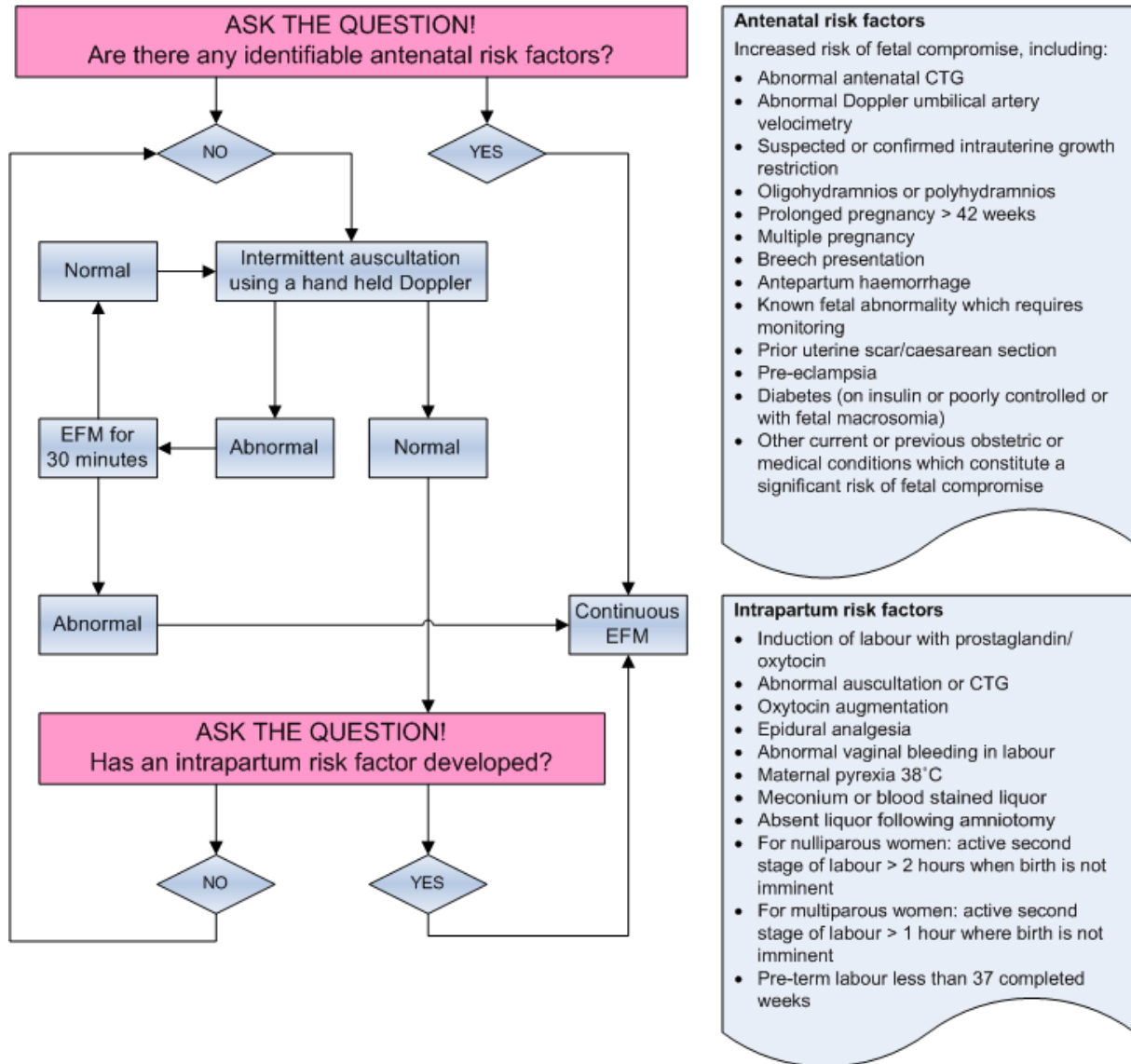
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APPENDIX 1: INTRAPARTUM FETAL HEART MONITORING

Intrapartum Fetal Heart Monitoring

Clinical Guidelines - Algorithm



APPENDIX 2: DESCRIPTIONS OF FETAL HEART RATE (FHR) PATTERNS

TERM	DEFINITION
<p>Baseline fetal heart rate</p> <p><i>Normal baseline:</i></p> <p><i>Bradycardia:</i></p> <p><i>Tachycardia:</i></p>	<p>The mean level of the FHR when this is stable, excluding accelerations and decelerations. It is determined over a time period of 5 or 10 minutes and expressed in bpm. Preterm foetuses tend to have values towards the upper end of this range.</p> <p>A trend to progressive rise in baseline is important as well as the absolute values.</p> <p>FHR 110-160 bpm</p> <p>< 110 bpm</p> <p>> 160 bpm</p>
<p>Baseline variability</p> <p><i>Normal baseline variability:</i></p> <p><i>Reduced baseline variability:</i></p> <p><i>Absent baseline variability:</i></p> <p><i>Increased baseline variability:</i></p> <p><i>Sinusoidal:</i></p>	<p>The minor fluctuations in baseline FHR. It is assessed by estimating the difference in beats per minute between highest peak and lowest trough of fluctuation in one minute segments of the trace.</p> <p>6-25 bpm between contractions</p> <p>3-5 bpm</p> <p>< 3 bpm</p> <p>> 25 bpm</p> <p>A regular oscillation of baseline FHR resembling a sine wave. This smooth, undulating pattern is persistent, has relatively fixed period of 2-5 cycles per minute and an amplitude of 5-15 bpm above and below the baseline. Baseline variability is absent and there are no accelerations.</p>
<p>Accelerations</p>	<p>Transient increases in FHR of 15 bpm or more above the baseline and lasting 15 seconds. Accelerations in preterm fetus may be of lesser amplitude and shorter duration. The significance of no accelerations on an otherwise normal CTG is unclear.</p>
<p>Decelerations</p> <p><i>Early decelerations:</i></p> <p><i>Variable decelerations:</i></p> <p><i>Atypical/complicated variable decelerations:</i></p> <p><i>Prolonged decelerations:</i></p> <p><i>Late decelerations:</i></p>	<p>Transient episodes of decrease of FHR below the baseline of more than 15 bpm lasting at least 15 seconds, conforming to one of the patterns below:</p> <p>Uniform, repetitive decrease in FHR with rapid onset early in the contraction and slow return to baseline by the end of the contraction.</p> <p>Repetitive or intermittent decreasing of FHR with rapid onset to return to baseline. Time relationships with contraction cycle may be variable but most commonly occur simultaneously with contractions.</p> <p>The following additional features increase the likelihood of fetal hypoxia:</p> <ul style="list-style-type: none"> • Rising baseline rate or fetal tachycardia • Reducing baseline variability • Slow return to baseline FHR after the end of the contraction. • Large amplitude (by 60 bpm or to 60 bpm) and/or long duration (60 secs) • Presence of post deceleration smooth overshoots (temporary increase in FHR above baseline) <p>Decrease of FHR below the baseline of more than 15 bpm for longer than 90 seconds but less than 5 minutes.</p> <p>Uniform, repetitive decreasing of FHR with, usually, slow onset mid to end of the contraction and more than 20 seconds after the peak of the contraction and ending after the contraction. In the presence of non-accelerative trace with baseline variability < 5 bpm, the definition would include decelerations < 15 bpm.</p>

APPENDIX 3: FETAL MONITORING – USING A CTG MACHINE IN A PRIMARY BIRTHING UNIT

The CTG machine is **NOT** to be used for laboring women in a primary birthing unit. It is **only** to be used for the two antenatal situations as described below.

Maternal pulse must be monitored either continuously by way of a pulse oximeter or manually and documented regularly on the CTG printout.

OCCASIONS FOR USE OF A CTG IN A PRIMARY BIRTHING UNIT

Decreased Fetal Movements (DFM)

When a woman reports DFM on the first occasion **only**, commence a CTG and if there are concerns at any stage of the CTG call the CWH Birthing Suite Co-ordinator (CCO) on 027 836 4673 to discuss your findings. The CCO will then liaise with the on call Registered Medical Officer. The CTG is to be faxed to Birthing Suite as required on 03 364 4717.

Follow up CTGS for rural women

Following an assessment and consultation with Christchurch Women's Maternity Outpatient Department CTGs may be performed as part of the ongoing plan to ensure women do not have to travel in to CWH. If any concerns during daytime hours please fax to Day Assessment Unit (DAU) at 03 364 4471.

All instances of CTG use in a primary birthing unit and resultant care plans are to be fully documented.