Document No: **2499498**

TITLE: Fetal Heart Monitoring

Contents

1. Purpose

To provide guidance for staff in the use of fetal heart rate monitoring methods in the antenatal and intrapartum periods and in the interpretation of the results of that monitoring. To reduce adverse perinatal outcomes related to the process of fetal heart rate monitoring.

2. Scope

This guideline applies to all Te Whatu Ora Lakes Obstetric medical staff, employed midwives, midwifery students and to all Lead Maternity Carers (LMC's) who have an Access Agreement with Te Whatu Ora Lakes, and the women they provide care to.

3. Definitions

bpm	Beats per minute
CTG	Cardiotocograph
DR	Dawes-Redman Criteria
EFM	Electronic Fetal Monitoring
FHR	Fetal Heart Rate
FSA	Fetal Scalp Electrode
IA	Intermittent Auscultation
IV	Intravenous
RANZCOG	The Royal Australian and New Zealand College of Obstetricians and Gynaecologists

4. Overview

The aim of fetal heart rate (FHR) monitoring is to prevent adverse perinatal outcomes by identifying that a fetus is at risk of compromise in time to enable appropriate intervention that increases the likelihood of a favourable outcome.

Fetal heart rate monitoring is part of antenatal and intrapartum care and can be performed by either;

- **Intermittent Auscultation (IA):** by fetoscope, Pinard Stethoscope or Doppler
- **Electronic Fetal Monitoring (EFM):** by cardiotocograph (CTG), intermittent or continuous

Discussion with women about fetal heart monitoring should occur antenatally and include the reasons for recommending intermittent auscultation or EFM.

If EFM is recommended in labour, the rationale will be discussed with women and her informed consent obtained.

Women who decline continuous EFM will be supported with the use of close intermittent auscultation. The wellbeing of women and their wishes will be considered and respected in relation to fetal heart rate monitoring.

5. Antenatal Fetal Heart Monitoring

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

• **<28 weeks' gestation**	Only IA - unless discussed with an Obstetrician and justification is documented.
• **28 - 37 weeks' gestation**	Use of EFM will be based on clinical indication and should first be discussed with the Obstetric team.
• **>37 week's gestation**	EFM should be performed as part of any assessment where there is reason to be concerned about fetal wellbeing.

In any case of suspected intrauterine fetal demise, EFM is not appropriate and initial investigation with ultrasound scan is recommended.

Indications for Antenatal EFM

Maternal	Fetal
• Severe maternal disease e.g. autoimmune, heart, lung, renal, anaemia, hypothyroid. • Antepartum haemorrhage • Undiagnosed abdominal pain • Maternal infection • Hypertensive disorders in pregnancy • Pre-eclampsia and hypertension • Abdominal trauma • Pre-term rupture of membranes • Term pre-labour rupture of membranes • Diabetes requiring medication or poorly controlled • Suspected preterm labour • Prolonged pregnancy (≥41+0 weeks gestation) • Prior to and following any external cephalic version	• Reduced fetal movements • Oligohydramnios • FHR abnormal on IA • Confirmed SGA/FGR • Fetal arrhythmias • Rhesus isoimmunisation • Multiple pregnancy • Abnormal doppler • Previous abnormal CTG

Use of EFM (CTG) in a Primary Birthing Unit

Taupo Maternity Unit can offer antenatal CTG for rural women for the following indications;

- Reduced fetal movements – first presentation only
- As indicated by the obstetric team i.e. following outpatient department consultation
- If, on IA, there are any concerns i.e. a deceleration is heard

The use of EFM in a Primary Birthing Unit during labour is **not** recommended or supported.
If there are concerns about the fetal heart rate in labour EFM may be used immediately prior to and during consultation with the Obstetric team and should then either be discontinued and IA reinstated or transfer to Rotorua Maternity Unit arranged for ongoing EFM monitoring.

Non-computerised CTG Interpretation

- A CTG, using a standard CTG machine, should be no less than 20 minutes in duration
- If the CTG continues for longer than 20 minutes' duration, due to not meeting the definition of normal, never leave it unattended for longer than a period of 20 minutes.
- A normal CTG includes the following features:
    - A baseline FHR of 110 – 160 beats per minute (bpm)
    - Baseline FHR variability of 6 - 25bpm
    - The presence of accelerations – transient increases in FHR of 15bpm above the baseline and lasting 15 seconds at the baseline.

      Accelerations in the preterm fetus may be of lesser amplitude and shorter duration. The significance of no accelerations on an otherwise normal CTG is unclear
    - No decelerations – transient decreases of the FHR below the baseline lasting at least 15 seconds, conforming to one of the patterns below. See Appendix 1. for descriptions of early, variable, complicated variable, prolonged, late decelerations and bradycardia. RANZCOG (2019)

All other CTGs by this definition are abnormal and require further evaluation, taking into account the full clinical picture. (See page 8 CTG Interpretation)

Computerised CTG – Using Dawes-Redman Criteria

Dawes-Redman (DR) analysis software, available on Huntleigh Team 3 CTG machines, tests the fetal heart rate parameters against defined criteria of a normal CTG and it highlights abnormalities. Studies have shown its use improves perinatal outcomes, caesarean section rates and diagnostic interventions compared to traditional CTG (Kouskouti, 2018).

When **TO** use DR CTG Analysis;

- **only for antenatal CTG's** – when an equipped machine is available
- for any gestation **over 26 weeks** – N.B.: <32 weeks may take longer to achieve criteria
- can be used for twins - has limited accuracy as it doesn't account for fetal movements

When **NOT** to use DR CTG Analysis;

- It is not suitable for use in triplets
- When medication is being administered i.e. Magnesium sulphate for pre-eclampsia
- Do not use for latent or established labour (intrapartum) CTG analysis - the presence of other factors such as contractions, pharmacological agents and epidural analgesia are not able to be factored into the analysis.

Dawes-Redman analysis does not provide a diagnosis, but is an aid to clinical management.

The analysis provided by Dawes-Redman is intended to assist, not to replace visual assessment of a CTG trace. It should be considered within the context of a full clinical assessment before decisions are made regarding management.

For details about how to set up and use Dawes-Redman criteria see Appendix 2.

6. Intrapartum Fetal Heart Monitoring

An initial assessment of a woman presenting in labour should include:

- **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 GROW chart
- **Fetal movements** – presence and usual pattern
- Assessment of **uterine activity** – frequency, length, strength, resting tone, uterine irritability and tenderness
- **Maternal pulse** – recorded to distinguish it from the fetal heart rate

The decision of method of fetal monitoring will be made in discussion with the woman, taking into consideration her pregnancy, gestation and the presence of any risk factors.

The RANZCOG Intrapartum Fetal Surveillance Guideline (2019) acknowledges difference of opinion and evidence regarding use of 'admission CTG' for women with no risk factors. At Te Whatu Ora Health New Zealand Lakes, for women in spontaneous labour with uncomplicated pregnancies, intermittent auscultation (IA) is recommended without the need for an admission CTG.

Women with specific risk factors (listed in Appendix 1.) are advised to have continuous electronic fetal monitoring (EFM).

Intermittent Auscultation (IA)

(See Appendix 1. for instances where intermittent auscultation is not recommended.)

Intermittent auscultation is a method that involves listening to the fetal heart rate with a hand-held device, counting and documenting this as a single number (like documentation of maternal pulse rate) rather than a range. Because there is not a printed trace to interpret the terminology used around IA is different from that used for CTG's.

In addition to the initial overall assessment for all women, document:

- **Baseline or average fetal heart rate** – determined by listening toward the end of a contraction and counting for 30-60 seconds on several occasions in the absence of fetal movements and heart rate increases and decreases.
- **Fetal heart rate rhythm** – regular or irregular
- **Fetal heart rate increases** – temporary increase of at least 15 bpm above the average that usually coincides with fetal movement
- **Fetal heart rate decreases** – abrupt or gradual decrease in heart rate from the average, should not be audible when auscultation is performed immediately after a contraction for 60 seconds in the first stage of labour

Ongoing Monitoring Using IA

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

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

It is also recommended to auscultate the FHR:

- after spontaneous rupture of the membranes (SRM)
- after vaginal examination (VE)
- before and after artificial rupture of the membranes (ARM)

IA Interpretation

Normal findings:
- Fetal heart rate between 110-160 bpm
- No fetal heart decreases below the average
- Regular rhythm

Abnormal findings:
- Tachycardia (> 160 bpm)
- Bradycardia (< 110 bpm)
- The average fetal heart rate is rising
- Gradual or abrupt decreases in fetal heart rate
- Irregular rhythm

Continuous Electronic Fetal Monitoring (EFM)

Risk Factors

If there are any antenatal or intrapartum risk factors (see Appendix 1.) continuous EFM is recommended and an individualised plan made with the woman.

CTG Machine Use

For continuous EFM to be interpreted;

- uterine activity and fetal heart rate must be clearly recorded with minimal loss of contact
- the abdominal transducer and toco are placed according to palpation findings and adjusted with maternal and fetal position changes and fetal descent
- continuous maternal pulse rate monitoring and recording on the CTG should be used when available
- it is recommended that the hand held patient event marker is used by the woman to clearly determine fetal movements (the automatic fetal movement detector is not a reliable method for detecting fetal movement as it can be triggered by low velocity movement).

Interruptions

Continuous EFM may be interrupted for infrequent periods of up to 15 minutes to allow for personal care (e.g. toilet or shower) if the CTG to date is normal. Interruptions should not occur following intervention that has potential to alter the fetal heart rate (e.g. medication, rupture of membranes).

Interpretation:

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 education section below).

CTG Interpretation

Use a CTG Sticker Tool to assist with the analysis and interpretation of the CTG (see Documentation section).

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 15bpm for 15 seconds.
  - No decelerations.

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

Abnormal CTG

- The following features are unlikely to be associated with fetal compromise when occurring in isolation:
  - Baseline rate 100-109 bpm.
  - Reduced or reducing baseline variability 3-5bpm.
  - Absence of accelerations.
  - Early decelerations.
  - Variable decelerations without complicating features.
- The following features may be associated with significant fetal compromise and require further action:
  - Baseline fetal tachycardia >160 bpm.
  - Rising baseline fetal heart rate (including where it remains within normal range).
  - Complicated variable decelerations.
  - Late decelerations.
  - Prolonged decelerations (a fall in the baseline fetal heart rate for more than 90 seconds and up to 5 minutes).
- The following features are likely to be associated with significant fetal compromise and require immediate management, which may include urgent delivery:
  - Bradycardia (a fall in the baseline fetal heart rate for more than 5 minutes).
  - Absent baseline variability <3bpm.
  - Sinusoidal pattern.
  - Complicated variable decelerations with reduced or absent baseline variability.
  - Late decelerations with reduced or absent baseline variability.

RANZCOG (2019)

N.B.: See Appendix 4. for Fetal Monitoring Reference Guide with definitions of the above terms as well as descriptions of uterine activity (contractions).

Abnormal Fetal Heart Rate

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

- Check **maternal pulse**/attach maternal probe if not recorded by toco
- Check **positioning of CTG** transducer
- Change **maternal position** to increase utero-placental perfusion and/or alleviate cord compression
- Continue or commence **continuous EFM**
- Identify any **reversible cause** of the abnormality and initiating appropriate action e.g.
  - correct **maternal hypotension** due to hypovolaemia or epidural analgesia
  - **stop oxytocin infusion*** and/or give acute tocolysis for excessive uterine activity
- Escalate for further review

***NOTE: In certain circumstances, oxytocin infusion may be reduced rather than discontinued, to maintain a dose sufficient for continuing augmentation of labour but without hyperstimulation. The CTG trace must be reviewed by the obstetric team prior to a decision on the continuing dose of oxytocin for augmentation.

Fetal Scalp Electrode Monitoring

Use of a fetal scalp electrode (FSE) is indicated when there is significant loss of contact with the fetal heart rate, using abdominal monitoring, which is not able to be rectified with palpation and repositioning of the transducer.

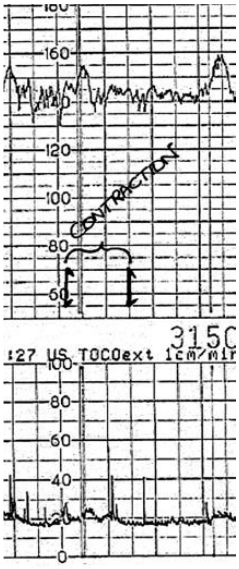
Contraindications to the use of an FSE:

- known maternal infection, e.g. HIV, Hepatitis B & C, active Herpes Simplex or evidence of intrauterine sepsis. Group B Streptococcus carrier status does not preclude FSE
- History of genital herpes – avoid FSE if possible unless benefits outweigh risks
- Prematurity < 34 weeks unless the following apply:
  - it is not possible to monitor the fetal heart rate using either external cardiotocography or intermittent auscultation
  - it has been discussed with a senior obstetrician
  - the benefits are likely to outweigh the potential risks
  - the alternatives (immediate birth, intermittent ultrasound and no monitoring) have been discussed with the woman and are unacceptable to her
- Face, brow or uncertain presentation
- Bleeding disorder such as suspected fetal thrombocytopenia, haemophilia or known maternal autoimmune thrombocytopenia

Fetal Blood Sampling

There is currently no provision for Fetal Blood Sampling (FBS) in Rotorua or Taupo due to the medical staffing model. Careful observation and interpretation of the CTG in the context of the overall clinical picture, use of 'fresh eyes' second opinion are required and birth expedited if there are concerns about fetal wellbeing.

Uterine Activity Monitoring



Uterine activity (contractions) must be recorded on the CTG to enable overall interpretation of the CTG. If it is difficult to obtain a clear record of uterine contractions on a CTG despite adjusting the toco, contractions must be recorded manually on the CTG paper.

To do this use the fetal movement button to record the start and the end of the contraction and then draw a bracket between the two markers on the CTG paper once it has rolled out of the machine.

NB.: marking the CTG paper with a pen at the time of the contraction will result in inaccurate recording as it takes 1 minute for the paper to exit the machine.

Excessive Uterine Activity

- Excessive uterine activity in the **absence** of fetal heart rate abnormalities is 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 EFM
        - Consider reducing or ceasing oxytocin infusion
        - Staff remain with the woman until normal uterine activity is observed
        - Consider tocolysis*

- Excessive uterine activity in the presence of fetal heart rate abnormalities is defined as;
    - **Uterine hyperstimulation** (uterine tachysystole or hypertonus in the presence of fetal heart rate abnormalities)

      Appropriate management of **uterine hyperstimulation** should include:
        - Continuous electronic fetal monitoring
        - Reducing or ceasing oxytocin infusion
        - Staff remain with the woman until normal uterine activity is observed
        - Consider tocolysis*
        - Consider urgent delivery

*Tocolytic regimes include:
- Terbutaline, 250 micrograms subcutaneously or intravenous (IV) – in birthing unit
- Glycerin Trinitrate (GTN), 100-200 micrograms IV – in theatre

'Fresh Eyes' Opinion

Fetal monitoring interpretation errors are a critical contributory factor in cases where there is a poor neonatal outcome (RCOG, 2015). A 'fresh eyes approach to CTG interpretation, involving a second person regularly reviewing the CTG, has been shown to reduce errors.

The CTG should be systematically reviewed using the 'Fresh Eyes' approach;

- At least hourly - on any CTG longer than 1 hour
- By two qualified professionals
- And include an assessment of the baseline rate, variability, accelerations, decelerations and contractions

A pre-printed CTG sticker should be completed and placed in the maternity records at least every hour by the midwife. The 'Fresh Eyes' buddy should then independently assess the CTG.

Agreement on the overall assessment should then be recorded in the clinical record, signed, dated and timed as well as noted on the CTG paper and signed by both professionals.

If staff are unable to agree the overall assessment, the CTG should be reviewed by the Obstetric Consultant or Registrar. Midwives can refer directly to the consultant, if not in agreement with the advice about the CTG interpretation or labour management, through the usual referral pathways.

7. Documentation

The findings from both IA and review of continuous EFM should be carefully documented. A Partogram may be useful during EFM and IA as it may provide a visual indication of changes in the fetal heart rate, such as a rising baseline.

When using IA

- The FHR is documented as a single number i.e. 136 bpm
- The timing and duration of auscultation should be documented as well as the equipment used to listen to the fetal heart.

When Commencing EFM (CTG)

Ensure to document that:

- the procedure has been explained and consent has been given
- an abdominal palpation has been performed and the fetal position determined
- the date and time on the CTG machine is correct
- the CTG machine is set to a paper speed of 1 centimetre (cm) per minute.
- the following information is documented on the CTG paper:
    - Maternal name and National Health Index (NHI) number (attach patient label)
    - Date and time of commencing the CTG
    - Maternal pulse
    - Indication for CTG
    - Any risk factors

While EFM (CTG) is in Progress

- Record on the CTG paper any event which may affect the FHR e.g. vaginal examination, epidural insertion, change of position.
- Document the maternal pulse on the CTG paper (if it isn't already being printed) if there is a gap in recording the FHR or a sudden change in baseline
- Ensure that any member of staff who is asked to provide an opinion on the CTG signs the CTG paper at the point of the review and documents the date, time, signature, opinion and plan in the women's clinical record
- The CTG trace should be classified as either **NORMAL** or **ABNORMAL**.
- An abnormal CTG should be continued and a request made for immediate obstetric review.

The CTG Sticker should be used to assist with EFM interpretation and be completed;

- 20 minutes after a CTG has initially been applied
- When the CTG is identified as abnormal
- On discontinuing the CTG
- More frequently if a change in the appearance from the previous review
- Every hour if continuous CTG is requested
- Contemporaneously and fixed into the women's clinical records
- In all cases the midwife and, if involved, an obstetrician, must document a plan on, or below, the CTG sticker

CTG Sticker Interpretation Tool

To complete the CTG Sticker fill in the boxes and circle the relevant option for each section;

N.B.: The 'Overall Assessment' and 'Action' are determined by the most abnormal feature circled (in red, furthest to the right), i.e. in the example below –'Late with ↓variability' was circled, therefore the overall assessment is the one below 'Very ABNORMAL' along with the corresponding actions.

CARDIOTOCOGRAPH (CTG):	Date: 5/12/21	Time: 1200hrs	☐ Antenatal ☒ Intrapartum	
Dilatation: 6 cms	Liquor: Cl	Maternal Pulse: 86	Gestation: 37+4 /40	*Fetal movements Y/N
Risk	Indication: In labour, oxytocin augmentation			
Contractions	None Irregular (Regular) Mild (Moderate) Strong			.....3..... in 10 mins
Baseline Rate .....125.... bpm	(110–160)	100–109 bpm	>160 bpm Rising baseline	<100 bpm for >5 mins Rising baseline
Variability	6 – 25 bpm		(Reduced (3-5 bpm))	Absent (<3 bpm) Sinusoidal
Accelerations	Present	*Absence of accelerations with otherwise normal trace is of uncertain significance*		
Decelerations	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 ↓ variability (3. Late with ↓variability)
Overall Assessment *(based on MOST abnormal feature)*	**NORMAL**	**ABNORMAL** **Unlikely** associated with significant fetal compromise	MORE **ABNORMAL** **May be** associated with significant fetal compromise	VERY **ABNORMAL** **Very likely** associated with significant fetal compromise
Determine Action	No action required	☐ Correct reversible causes * ☐ Fresh Eyes Opinion	☐ Correct reversible causes * ☐ **Urgent** referral to Reg./Cons.	☐ Correct reversible causes * ☐ **Urgent** referral to Reg./Cons.
Plan	(e.g. tocolysis, continue CTG) Oxytocin rate reduced, change maternal position, continue CTG, further Obstetric review in 20 mins			
Print Name: : M Smith		Sign: M Smith		*See Lakes FH Monitoring Guideline
'Fresh Eyes': Name:		Sign:		

The midwife must notify the abnormal CTG to a senior midwifery colleague i.e. Clinical Midwife Coordinator (CMC) while waiting for obstetric review.

The obstetric plan could include the following:

- Repeat CTG at a later time - midwife to escalate to obstetric team if again abnormal
- Escalate to Obstetric Senior Medical Officer
- Continue CTG with a time stated for next review by obstetric registrar.

One to One Care

For women receiving continuous CTG there should be one to one care. In situations where one on one care cannot be provided due to staffing levels and/or acuity, then the CTG must be reviewed every 20 minutes and a CTG sticker completed and fixed into the women clinical records on each occasion. A Datix form should be completed if one to one care is unable to be provided.

At completion of a CTG

Document the following;

- Date, time and signature of person discontinuing the CTG together with the reason for discontinuation and the plan.
- After birth, sign the CTG paper and note the date, time and mode of birth.
- Number the CTG – if multiple CTG's these need to be numbered in chronological order
- Store CTG paper securely within CTG envelope in the woman's clinical record

8. Education

It is acknowledged that to develop and maintain skills in EFM and interpretation, in addition to these guidelines, staff need to complete a comprehensive, ongoing education and training programme.

Fetal monitoring training is recommended for all Te Whatu Ora Health New Zealand Lakes health professionals undertaking any aspect of EFM and for all self-employed Lead Maternity Carers (LMC's).

LDHB staff are encouraged to complete fetal heart monitoring training every two years consisting of either:

- K2 Perinatal Training Programme (online learning) https://training.k2ms.com/
- Online Fetal Surveillance Education Programme (OFSEP) https://ofsep.fsep.edu.au/
- Fetal Surveillance Education Programme (FSEP) full day face-to-face workshop

9. References

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- Canterbury DHB (2020). Fetal Heart Monitoring – Maternity Clinical Guideline
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- NZCOM (2020). Practice guidance document Intermittent Auscultation for the Assessment of Intrapartum Fetal Wellbeing. July 2020
- RANZCOG (The Royal Australian and New Zealand College of Obstetricians and Gynaecologists) 2019. Intrapartum Fetal Surveillance Clinical Guideline – Fourth Edition
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- Preterm labour and birth, NICE Guideline [NG25], November 2015 https://www.nice.org.uk/guidance/ng25

10. Clinical Audit

RANZCOG (2019) recommend that regular multidisciplinary audit of implementation of guidelines and regular reviews of clinical practice should be performed.

Aspects of care and guideline implementation that are suitable for audit include:

- Women receiving continuous CTG (including those with and without indications for EFM)
- Women with indications for continuous CTG who did not receive it
- CTG interpretation the use of CTG stickers
- Whether ‘Fresh Eyes’ was performed and the frequency of this
- Delivery interventions arising from clinical interpretation of the CTG
- Poor perinatal outcomes
- Umbilical cord blood gas analysis
- Maternal satisfaction with labour care

Authorised by: **Maternity Clinical Quality Improvement (CQI) Meeting**

11. Appendices

Appendix 1. Antenatal and Intrapartum Risk Factors – EFM Recommended

Antenatal and intrapartum factors that increase risk of fetal compromise. Intrapartum cardiotocography is recommended	
Antenatal Risk Factors	**Intrapartum Risk Factors**
• abnormal antenatal CTG	• induction of labour with prostaglandin/oxytocin
• abnormal Doppler umbilical artery velocimetry	• abnormal auscultation or CTG
• suspected or confirmed intrauterine growth restriction	• oxytocin augmentation
• oligohydramnios (MVP < 2cm or AFI < 5cm) or polyhydramnios (MVP > 8cm or AFI > 20cm or as defined by local referral guidelines)	• regional anaesthesia (e.g. epidural* or spinal)
• prolonged pregnancy ≥ 42 weeks	• abnormal vaginal bleeding in labour
• multiple pregnancy	• maternal pyrexia ≥ 38°C
• breech presentation	• meconium or blood stained liquor
• antepartum haemorrhage	• absent liquor following amniotomy
• prolonged rupture of membranes (≥ 24 hours)	• prolonged first stage as defined by referral guidelines
• known fetal abnormality which requires monitoring	• prolonged second stage as defined by referral guidelines
• uterine scar (e.g. previous caesarean section)	• pre-term labour less than 37 completed weeks
• essential hypertension or pre-eclampsia	• tachysystole (more than five active labour contractions in ten minutes, without fetal heart rate abnormalities)
• diabetes where medication is indicated or poorly controlled, or with fetal macrosomia	
• other current or previous obstetric or medical conditions which constitute a significant risk of fetal compromise (e.g. cholestasis, isoimmunisation, substance abuse)	• uterine hypertonus (contractions lasting more than two minutes in duration or contractions ocurring within 60 seconds of each other, without fetal heart rate abnormalities)
• fetal movements altered unless there has been demonstrated wellbeing and return to normal fetal movements	• uterine hyperstimulation (either tachysystole or uterine hypertonus with fetal heart rate
• morbid obesity (BMI ≥ 40)	*** Following a decision to insert an epidural, a CTG should be commenced to establish baseline features prior to the epidural insertion**
• maternal age ≥ 42	
• abnormalities of maternal serum screening associated with an increased risk of poor perinatal outcomes (e.g. low PAPP-A <0.4MoM or low PlGF)	
• abnormal placental cord insertion	
• abnormal cerebroplacental ratio	

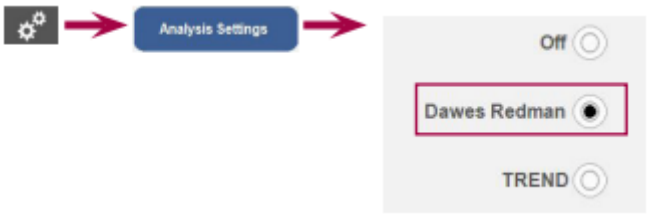
Conditions where an intrapartum cardiotocography is not indicated when the condition occurs in isolation, but if multiple conditions are present, intrapartum cardiotocography should be considered
• pregnancy gestation 41.0 – 41.6 weeks' gestation
• gestational hypertension
• gestational diabetes mellitus without complicating factors
• obesity (BMI 30-40)
• maternal age ≥ 40 and < 42 years
• AFI 5-8cm (or MVP 2-3cm)
• Intrapartum maternal pyrexia ≥ 37.8°C and < 38°C

RANZCOG, 2019

Appendix 2. Performing Computerised CTG – Dawes Redman Analysis

- Turn the CTG monitor on – the Dawes-Redman analysis button may be grey with a 'Not Available' symbol in red or the monitor button may be set to 'TREND';

- To remove the symbol or to change from 'TREND' and make analysis available, ensure Dawes-Redman is enabled by pressing the Settings icon -> 'Analysis Settings' button then choosing 'Dawes Redman'



Ensure only 1x ultrasound transducer is plugged in, unless monitoring twins. If a second ultrasound transducer is left plugged in, but not used, this will affect the analysis.

- Enter the gestation in weeks & days (the analysis will not start unless gestation is entered)
- Turn the printing on
- After 10 minutes if the DR criteria is met, this will be displayed on the bottom of the screen (with a tick).
- If the DR criteria is not met, then continue to record the CTG.
- If the trace is stopped before the criteria have been met, and before 60 minutes, this will invalidate the analysis.

Applying the Dawes Redman criteria

The first analysis is reported after 10 minutes of good quality CTG tracing. It is then repeated every two minutes up to a maximum of 60 minutes. There are two possible outcomes:

- Criteria met
- Criteria not met.

Criteria are met

This can be met in as little as 10 minutes. The CTG can be stopped after this time subject to visual assessments and clinical judgement. Do not rely on the analysis in isolation. It may not always identify unusual or pathological patterns that may be more obvious from visual interpretation or overall assessment and knowledge of the whole clinical picture.

If the analysis of the CTG is not stopped after the criteria is met, it is possible for the results to change to 'criteria not met'.

Criteria not met before or at 60 minutes

This simply indicates that the criteria have not YET been met and normality has not been demonstrated. There are many reasons for this including uncertain base rate determination and fetal behavioural state (e.g. sleep state). Unless there are clear pathological features, or any cause for concern, continue the trace until the criteria are met.

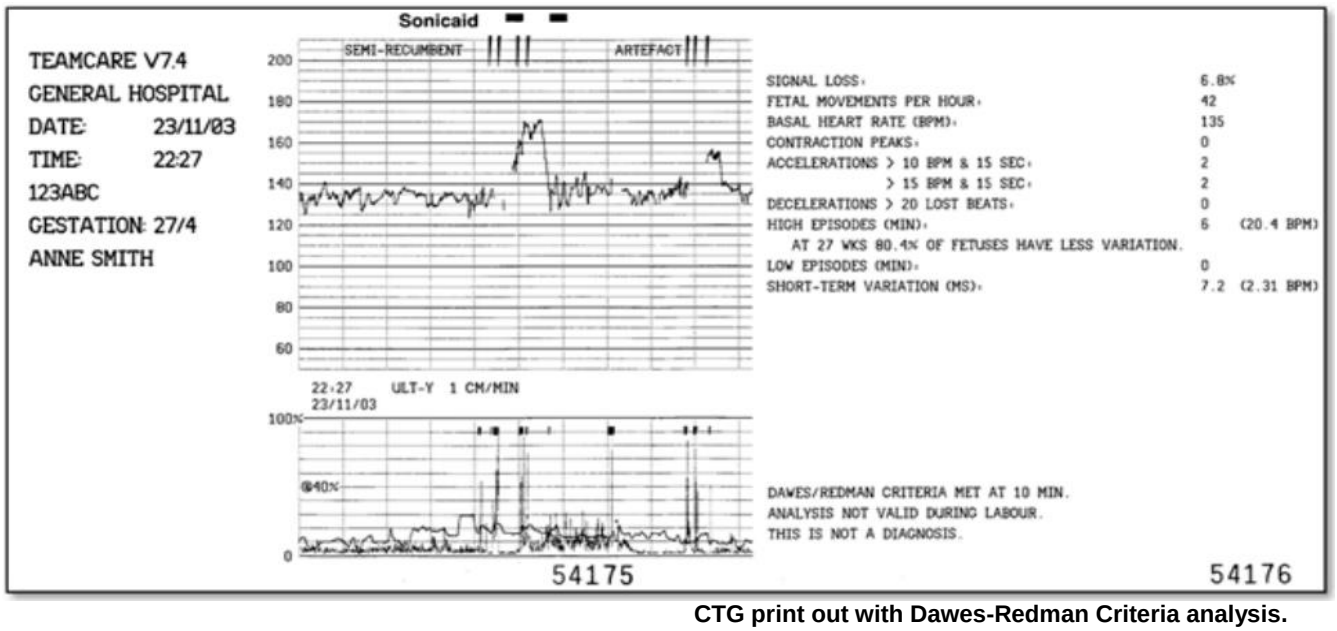
Criteria not met after 60 minutes

- This is an ABNORMAL outcome
- DR analysis stops at 60 minutes, after printing the table of results, monitoring will continue
- A visual review of the CTG, the reasons for failure and the overall clinical picture must be reviewed by an Obstetric Registrar/SMO.
- See Appendix 3. for a list of codes for why the criteria not been met.
- Check the short-term variation (STV) (ms):

Short-term variation (STV) is a useful measure of fetal condition. However, it is only valid if measured after 60 minutes of recording and is only one aspect of fetal condition.

STV values:	
<4msecs	low
<3msecs	abnormal
<2msecs	highly abnormal

STV must NOT be used in isolation as an indicator of fetal condition – you can have a normal STV with a severely compromised fetus particularly where the fetus is affected by infection or anaemia.



CTG print out with Dawes-Redman Criteria analysis.

Appendix 3. Reasons for Dawes-Redman Criteria NOT Being Met

If the Dawes-Redman criteria were not met, the reasons will be included on the printout.

Possible reasons are:

Reasons for Dawes-Redman Criteria NOT Being Met
• Basal heart rate outside normal range
• Large decelerations
• No episodes of high variation
• No movements and fewer than 3 accelerations
• Baseline fitting is uncertain
• Short-term variation is less than 3 milliseconds (ms)
• Possible error at the end of the record
• Deceleration at the end of the record
• High-frequency sinusoidal rhythm
• Suspected sinusoidal rhythm
• Long-term variation in high episodes below acceptable level
• No accelerations

Double asterisks (**) indicate that the criteria have not been met due to one or more of the following conditions:

- Fetal heart rate < 116 bpm or > 160 bpm on a record of less than 30 minutes
- Decelerations > 100 lost beats (> 20 lost beats on a record of less than 30 minutes)
- No moves and fewer than 3 accelerations
- No episodes of high variation
- Short term variation < 3ms
- No accelerations and either;
    - < 21 movements per hour or
    - long term variation in episodes of high variation below the tenth centile
- Long term variation in episodes of high variation below the first centile

A single asterisk (*) indicates one of the following conditions:

- Short term variation < 4ms, but ≥ 3 ms
- Basal heart rate < 116 bpm or > 160 bpm on a record ≥ 30 minutes
- Decelerations present, but not meeting the criteria for size or record length

A single asterisk does not necessarily mean that the record cannot pass the criteria. If all other parameters are normal at the 30-minute point, the abnormality could be within acceptable limits to meet the analysis criteria.

Appendix 4. Fetal Monitoring Reference Guide

FETAL MONITORING REFERENCE GUIDE

Te Whatu Ora
Health New Zealand
Lakes

CTG Interpretation - always assess the FULL clinical picture including palpation, liquor colour, length of labour etc.

Fetal Heart Rate Patterns - Use this guide to assist in completing the CTG Sticker Tool to document CTG review in clinical notes

TERM		DEFINITION
Baseline Fetal Heart Rate (FHR)		The mean level of the FHR when stable, in the absence of accelerations and decelerations and contractions. Determined over a time period of 5 or 10 minutes and expressed in bpm. A progressive rise in baseline is as important as absolute values.
Baseline Variability		The minor fluctuations around the BHR. Assessed by estimating the difference in bpm between the highest peak and lowest trough of fluctuation in one minute segments of trace between contractions.
Sinusoidal		A regular oscillation of the baseline FHR resembling a sine wave. This smooth, undulating pattern is persistent, with a fixed period of 2-5 cycles per minute and amplitude of 5-15 bpm above and below the baseline. Baseline variability is absent and there are no accelerations.
Accelerations		Transient increases in FHR of 15 bpm or more above the baseline and lasting 15 seconds at the baseline. The significance of no accelerations on an otherwise normal CTG is unclear.
Decelerations	Early decelerations	Transient increases in FHR of 15 bpm below the baseline lasting at least 15 seconds, conforming to one of the patterns below;
	Variable decelerations	Uniform, repetitive decrease of FHR with slow onset early in the contraction and slow return to the baseline by the end of the contraction
	Complicated variable decelerations	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.
		The following additional features increase the likelihood of fetal hypoxia • 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 seconds) • Presence of smooth post deceleration overshoots (temporary smooth increase in FHR above baseline)
	Prolonged decelerations	A fall in the baseline FHR for more than 90 seconds and up to 5 minutes
	Bradycardia	A fall in the baseline FHR for more than 5 minutes
	Late decelerations	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 contractions and ending after the contraction. In the presence of a non-accelerative trace with baseline variability <5 bpm, the definition would include decelerations of <15 bpm.
Uterine Activity		
	Tachysystole	More than five active labour contractions in ten minutes without FHR abnormalities.
	Uterine hypertonus	Contractions lasting more than two minutes in duration or contractions occurring within 60 seconds of each other, without FHR abnormalities.
	Uterine hyperstimulation	Either tachysystole or uterine hypertonus with FHR abnormalities

RANZCOG, 2019

Escalation Steps – if concerns about serious, sustained, fetal compromise are not heard...

MW in Charge - 'fresh eyes', discuss concerns → **Discuss concerns again with Registrar/SMO** → **Concerns unaddressed - elevate to on call Obstetric SMO**

Document No.: 2499498 Approved by: Maternity CQI Meeting Date: September 2022