# Electronic Fetal Heart Rate Monitoring Policy

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## 1. Purpose

Cardiotocography (CTG) is the most widely used technique for assessing fetal wellbeing in the developed world. The primary purpose of fetal surveillance by CTG is to help identify signs of suspected fetal compromise and minimise adverse fetal outcomes.[1]

CTGs have a high degree of sensitivity but a low level of specificity which means that they are very good at identifying which fetuses are well (high negative predictive value) but are poor at identifying which fetuses are unwell (low positive predictive value). 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.[2]

The increased obstetric intervention rates (caesarean section) associated with CTG can be reduced with the use of fetal blood sampling (FBS).[3]

## 2. Policy

Maternity clinicians are to follow this policy in conjunction with the:

- WA Health Cardiotocography Monitoring Policy - MP 0076/18 and Cardiotocography Monitoring Standard
- Women and Newborn Health Service (WNHS) KEMH Fetal Heart Rate Monitoring Clinical Practice Guideline including:
    - the WNHS clinical guideline for Fetal compromise (acute): Management if suspected **except that**:
        - the KEMH 'Obstetric registrar/Senior Registrar or Consultant' means the obstetric duty doctor.
        - the KEMH MR255 and MR 226 means the K2 INFANT-Guardian® System and K2 Athena maternity e-record
        - the **clinical indications for CTG** are found in Appendix 1

The aims of this policy are to:

- reduce the likelihood of CTG interpretation errors
- ensure timely and appropriate clinical response for abnormal CTGs
- improve the confidence of clinicians when describing and classifying CTGs
- improve the accuracy of verbal CTG handovers between clinicians
- describe WACHS specific clinician guidance where it differs from the endorsed KEMH Fetal heart rate monitoring clinical practice guideline
- ensure compliance with the WA health Cardiotocography Monitoring Policy - MP 0076/18.

**K2 Fetal Monitoring System**
WACHS uses the K2 INFANT-Guardian® System for electronic fetal heart monitoring.

The K2 INFANT-Guardian® System is an electronic CTG system (Guardian) with artificial intelligence software (INFANT) to support interpretation of the CTG at the bedside. INFANT® (**IN**telligent **F**etal **A**ssessme**NT**) System has been validated on databases of several thousand interesting, abnormal and challenging traces and been found to perform at the level of experts whose ability have been measured. [9]

The Guardian™ system communicates INFANT® around the health service network so that all monitoring can be viewed at central stations, offices or remotely from home, private practice or the command centre to ensure all CTGs of concern are flagged to experts wherever they may be.[10]

## 2.1 Intermittent Auscultation (IA)

- In the absence of any pregnancy or intrapartum risk factors Intermittent Auscultation (IA) is the recommended method for fetal surveillance using a hand-held doppler ultrasound with the speaker on.4,9,10
- An abdominal palpation should be performed prior to IA to determine the optimal location to listen to the FHR.
- The maternal pulse should be palpated simultaneously with FHR auscultation in order to differentiate between the two and maternal and both documented.

**Antenatal**

- In the antenatal period it is recommended that the FHR is auscultated for a period for at least one (1) minute and the rate recorded as an average.

**Intrapartum**

- Should be undertaken and documented every 15-30 mins in the active phase of labour and at least every 5 mins in the active second stage of labour.
- Each auscultation episode should be undertake during a  a palpated contraction and be continued for at least 60secs after the contraction has finished.3,4,9,10
- In addition, the FHR will be auscultated during a contraction once every 15 mins.
- Baseline variability cannot be assessed by IA
- If an acceleration is heard during a contraction, this could indicate a high likelihood that the maternal pulse is being recorded.  Notify senior midwife/obstetric doctor, apply maternal pulse oximetry and if there are any doubts, commence CTG. 9,10
- Where there is any abnormality in FHR or deceleration heard commence a CTG and notify senior midwife.

## 2.2 Indications for CTG

There is no evidence to support the use of routine admission CTG or evidence for antenatal or intrapartum CTG in women with uncomplicated pregnancies/births.

The clinical indication for CTG are found in Appendix 1.

## 2.3 Performing a CTG

**Standard CTG machine settings**

- Ensure that paper is always loaded into the CTG machines in case a paper trace is required. Paper scale is to be set to 30/240, this will ensure the CTG records the fetal heart at the actual baseline and reduces the likelihood of misinterpretation errors when the incorrect paper scale records the baseline rate incorrectly for the machine setting
- Date and time settings on the CTG machine are automatically cross-checked with the K2 INFANT-Guardian® System at the commencement of FHR monitoring.
- All episodes of CTG must be captured into the K2 INFANT-Guardian® System and the outcome recorded. The paper CTG will not need to be printed unless in K2 Downtime Procedure.

**Prior to commencing**

- Palpate maternal pulse simultaneously with the FHR in order to differentiate between maternal and FHRs and document into the K2 INFANT-Guardian® System.
- It is recommended that women do not have a CTG within 30 minutes of a cigarette or when fasting unless clinically indicated.

**During the CTG**

- The clinician will ensure that the CTG is recording correctly and showing no signs of abnormality before leaving the room.
- If a CTG is interrupted for any reason before a normal **(GREEN)** CTG is observed, it is to be recommenced as soon as possible.

## 2.4 CTG review process

If the CTG is classified as abnormal and has been escalated for review, a full CTG review and classification of the CTG must be recorded into the K2 INFANT-Guardian® System by both clinicians on each occasion of review /interpretation.

- All CTGs must be classified by two clinicians (neither of which are students) with appropriate expertise in CTG interpretation either (see Appendix 8):
  - two midwives – one of whom is a Level 3 CTG Practitioner, OR
  - one midwife and one obstetric doctor who is a Level 3 CTG Practitioner OR
- two obstetric doctors – one of whom is a Level 3 CTG Practitioner.
- Where there is not a Level 3 CTG Practitioner on site (usually one midwife sites), the midwife can request review via the K2 INFANT-Guardian® System by either (see Appendix 2):
  - agreed referral site, or
  - the Midwifery and Obstetric Emergency Telehealth Service (MOETS).
- Interpretation and documentation of CTG findings should occur, where able, at the bedside portal by both clinicians.
- The classification of the CTG is to be recorded into K2 INFANT-Guardian® System by both clinicians on each occasion of review / interpretation.

## 2.5 CTG handover

- CTG handover is to follow a standardised process for describing and documenting CTG classification.
- Clinicians are not to use vague descriptive terms for classifying a CTG including non-reassuring, sinister, pathological or non-evidenced based pattern descriptions such as sleep pattern, thumb-sucking pattern etc.
- DR C BraVADO is the preferred acronym to follow when interpreting and describing (verbal or written) CTGs:

| | | |
|---|---|---|
| **DR** | - | **D**etermine **R**isks (i.e. indication for CTG) |
| **C** | - | **C**ontraction pattern |
| **Bra** | - | **B**aseline **Ra**te |
| **V** | - | **V**ariability |
| **A** | - | **A**cceleration presence |
| **D** | - | **D**eceleration pattern |
| **O** | - | **O**verall classification (see Table 1) and **O**utcomes agreed |

## 2.6 CTG Classification

- Analysis / classification of the CTG must be made using a combination of pattern recognition, review of the individual woman's antenatal/ intrapartum history / risk factors and consideration of fetal physiology.
- All CTGs are to be classified using one of the four classifications below in Table 1.
- Classification will include a description of all CTG features including baseline, variability, accelerations, decelerations and overall assessment as being either:

| | | |
|---|---|---|
| - | **Green** | (**Normal**) |
| - | **Blue** | (**Abnormal** unlikely compromise) |
| - | **Amber** | (**Abnormal** maybe compromise) |
| - | **Red** | (**Abnormal** likely compromise – immediate management) |

- Where the midwife has any concerns the CTG is abnormal, notify Senior Midwife **OR** MOETS **OR** Obstetric Doctor for 2nd clinician review.
- If the CTG is anything **other than GREEN** at the 30-minute review, perform a full second clinician review / classification **and** continue CTG

**Table 1: CTG Classifications**

| CTG | Classification | Escalation |
|---|---|---|
| **Green - Normal** low probability of fetal compromise | All **four (4)** features are **green**<br>• baseline<br>• variability<br>• accelerations<br>• no decelerations | • Antenatal – obtain 2nd clinician review prior to discharge from K2 INFANT-Guardian® with plan of care<br>• Intrapartum - primary midwife complete CTG classification in the K2 INFANT-Guardian® System every 30 minutes **and**<br>• Intrapartum - obtain fresh eyes review every two (2) hours – if at a one midwife site follow process in Appendix 2 |
| **Blue - Abnormal** Unlikely probability of fetal compromise | Where **any** one (1) feature is **blue** (remaining features are also **blue** or **green**) | • First aid measures and observe response<br>• Obtain **second** clinician review (single midwife sites via Appendix 2). |
| **Amber - Abnormal** May be significant fetal compromise | Where **any** one (1) feature is **amber** (remaining features are **blue** or **green**) | • First aid measures and observe response<br>• Inform senior midwife/ shift coordinator and escalate to the on-call Obstetric doctor.<br>• Document care plan in the K2 INFANT-Guardian® System |

**CTG Classification Cont.**

| | | |
|---|---|---|
| **Red - Abnormal**<br>Likely significant fetal compromise that requires immediate management | Where any one (1) feature is **red,** or<br>two (2) or more features are **amber** (either at the same time or at two (2) consecutive 30-minute reviews) | • First aid measures and observe response<br>• Immediate obstetric management. |
| Clinician classification **differs** to the K2-INFANT concern/ classification state | | • the senior midwife/coordinator or MOETS or Obstetric doctor will review.<br>• If the second clinician classification also differs to K2-INFANT concern state, a mandatory reason will need to be documented in K2 INFANT-Guardian® System and a further third expert opinion must be obtained via process in Appendix 2. |

**Baseline Fetal Heart Rate classification**

| | |
|---|---|
| **Baseline FHR** | • the mean level of the FHR when it is stable; excluding during accelerations and decelerations<br>• Determined over a 5-10minute window and expressed in beats per minute (bpm)<br>• Must only be assessed between contractions and in the absence of fetal movements |
| **Green** | • 110 –160 bpm |
| **Amber** | • 100 -109 bpm |
| **Red** | • Less than 100 bpm<br>• Greater than 160 bpm |

**Variability classification**

| | |
|---|---|
| **Variability** | • Minor fluctuations in baseline FHR occurring at 3 -5 cycles / minute<br>• Measured by estimating the differences in bpm between the highest and lowest trough<br>• Must only be assessed between contractions |
| **Green** | • 6 – 25 bpm between contractions |
| **Blue** | • Less than 5 bpm for less than 30mins |
| **Amber** | • 3-5 bpm for more than 30mins<br>• Greater than 25 bpm for more than 30mins |
| **Red** | • Less than 3 bpm for 30 minutes **OR** sinusoidal trace |

**Antenatal accelerations classification**

| | |
|---|---|
| **Accelerations** | • Transient increases in FHR of 15 bpm or more above the baseline which last 15 seconds.<br>• Accelerations in the preterm fetus may be of lesser amplitude and shorter duration<br>• The acceptable minimum is two (2) accelerations in a 20minute window<br>• The significance of the absence of accelerations in an otherwise NORMAL GREEN ANTENATAL CTG is unclear. |
| **Green** | • Two (2) accelerations in 20 mins (not required in labour) |
| **Blue** | • Less than two (2) accelerations in less than 20 mins |
| **Amber** | • No accelerations present |

**Decelerations classification**

| | |
|---|---|
| **Decelerations** | • Transient decreases of the FHR below the baseline lasting at least 15 seconds, conforming to one of the patterns below. |
| **Green** | • No decelerations present |
| **Blue**<br>**Early decelerations** | • Uniform, repetitive decrease of the FHR with slow onset early in the contraction and slow return to baseline by the end of the contraction |
| **Blue**<br>**Variable decelerations** | • Repetitive or intermittent decrease of the FHR with rapid onset and recovery<br>• Time relationships with contraction cycle may be variable but most commonly occur simultaneously with contractions. |
| **Amber**<br>**Variable decelerations** | As for above but the presence of any additional features below increases the likelihood of fetal hypoxia:<br>• Rising baseline rate or fetal tachycardia.<br>• Reduced baseline variability.<br>• Slow return to baseline after the end of the contraction.<br>• Large amplitude (by 60 bpm or to 60 bpm) and/or long duration (60 seconds). Known as rule of 60's.<br>• Presence of smooth post deceleration overshoots (temporary smooth increase in FHR above baseline). |

**Decelerations classifications cont.**

| | |
|---|---|
| **Amber**<br>**Late decelerations** | Occur with EVERY contraction as they are caused by contractions in the presence of fetal hypoxia<br>Uniform, repetitive decreasing of FHR with:<br>• usually, slow onset at mid to end of the contraction, and<br>• nadir (lowest rate) occurs after the peak of the contraction, and<br>• ends after the contraction<br>In a non-accelerative trace with baseline variability < 5 bpm, this includes decelerations of < 15 bpm amplitude.<br>The following additional features increase the likelihood of fetal hypoxia:<br>• Rising baseline rate or fetal tachycardia.<br>• Reducing baseline variability.<br>• Slow return to baseline FHR after the end of the contraction.<br>• Large amplitude (by 60 bpm or to 60 bpm) and/or long duration (60 seconds). known as rule of 60's.<br>• Presence of smooth post deceleration overshoots (temporary smooth increase in FHR above baseline). |
| **Amber**<br>**Prolonged decelerations** | Decrease of FHR below the baseline for longer than 90 seconds but less than five minutes. |
| **Red**<br>**Sinusoidal Pattern** | • A regular oscillation of the baseline FHR resembling a sine wave.<br>• This smooth, undulating pattern is persistent, has a relatively fixed period of 2–5 cycles per minute and an amplitude of 6–15 bpm above and below the baseline. Baseline variability is absent and there are no accelerations.<br>• It is typically reflective of severe anaemia, with Hb levels below 50 gm/L |
| **Red**<br>**Bradycardia** | FHR less than 100 bpm for greater than 5 mins |

## 2.7 Antenatal CTG

**Interpretation and classification of antenatal CTG**

- CTGs are classified as either normal or abnormal.
- For antenatal women, the CTG must be classified as normal, prior to her discharge, by two clinicians (one being a level 3 CTG Practitioner) whilst the K2 INFANT-Guardian® System is still recording the CTG.
- If a normal antenatal CTG is recorded within a 10-minute period (i.e. all parameters are in the GREEN category (Appendix 2) the CTG can be discontinued except in cases of abdominal trauma or if clinically indicated.
- The doctor and senior midwife should be notified of any FHR abnormalities as per the escalation pathway (Appendix 3).
- Reversible causes of abnormal CTG should be considered for immediate action (Appendix 5).

- Should clinicians differ in their interpretation and/or management plan for a CTG, staff are to refer to the WACHS Maternity Care Clinical Conflict Escalation Pathway Policy.

Escalation of antenatal CTG see Appendix 3.

## 2.8 Intrapartum FHR monitoring

Any events relevant to interpretation of the CTG that occur during the recording will be entered or annotated using the K2 INFANT-Guardian® System e.g. change of position, vomiting, blood pressure, temperature, maternal pulse, syntocinon rate changes, vaginal examination.

**Midwifery care**

- Offer telemetry, when available.
- The use of CTG does not replace the need for one on one midwifery care.
- When a CTG is in use the woman requires one to one midwifery care
- If the CTG is considered normal, it may be interrupted for short periods of up to 15 minutes to allow for personal care. Such interruptions should be infrequent and not occur immediately after any intervention that might be expected to alter FHR i.e. artificial rupture of membranes.
- If an intrapartum CTG has been started because of concerns arising from IA and the CTG is normal after 20 minutes, the woman may, after consultation, with a medical officer, return to IA.
- The woman's well-being is to be considered and their informed choices respected in relation to CTG.
- Disturbances to the woman should be minimised e.g. monitoring volume low, upright positions/mobility and use of water for pain relief.
- Intrapartum CTGs must include recording of maternal pulse via oxygen saturation monitoring.
- If the fetal or maternal heart cannot be identified, or there is any suspicion of maternal tachycardia being recorded, fetal wellbeing will be assessed with real time ultrasound.

**Interpretation and review of Intrapartum CTG**

- The primary midwife must:
  - interpret and classify the CTG every 30 minutes in the K2 INFANT-Guardian® System
  - obtain a 'fresh eyes' review by a second midwife or Obstetric doctor every 2 hours and at any time a significant change occurs in the CTG.
- CTGs are classified as either **normal** or **abnormal**
- The doctor and senior midwife should be notified of any CTG abnormalities as per the escalation pathway (Appendix 4).
- Reversible causes of abnormal CTG should be considered for immediate action (Appendix 5).

Escalation of abnormal CTG – see Appendix 4.

**Should clinicians differ in their interpretation and/or management plan for a CTG, staff are to refer to the WACHS** Maternity Care Clinical Conflict Escalation Pathway Policy.

**Indications for fetal scalp electrode (FSE)**

- A fetal scalp electrode is to be considered when:
  - signal quality from external monitoring is poor, or
  - when a quality recording is not able to be obtained within a 10-minute period (KEMH Fetal Heart Rate Monitoring)
- This is to be discussed with the senior midwife or Medical officer and documented in the medical record
- Inatrpartum CTG with a maternal tachycardia (>100bpm) will either have an FSE applied or maternal pulse oximetry in order to accurately differentiate the two
- contraindications for FSE are as per KEMH Fetal Heart Rate Monitoring (KEMH Fetal Heart Rate Monitoring)
- All midwives and obstetric doctors must be proficient in the application of a fetal scalp electrode or escalate to a senior midwife or Obstetric doctor who is.
- Sites should provide education in FSE application for midwives and Obstetric doctors as required.

**Fetal scalp blood sampling (FBS)**

- When an abnormal FHR pattern indicates fetal compromise and birth is not imminent, Fetal Blood Sampling (FBS) analysis of lactate and/or pH values will provide a reliable diagnostic tool of fetal acidosis status, support decision making and may avoid unnecessary intervention.
- Evidence comparing fetal lactate and pH blood results demonstrate no difference in newborn outcomes including low Apgar's, low pH cord bloods or admissions to the neonatal intensive care nursery.
- Fetal blood lactate samples require a smaller amount of blood for analysis and therefore are more likely to be successfully performed with less scalp incisions.
- All sites must have available FBS equipment to undertake intrapartum fetal blood sampling including access to either blood pH or lactate analysers.
- Sites to ensure that there are midwives and Obstetric doctors proficient in FBS technique 24/7.
- Sites should ensure an appropriate local policy exists to determine who should perform the fetal blood collection (this is to be recorded in the site-specific escalation policy).
- Sites should provide education in FBS for midwives and Obstetric doctors as required.

**Table 2: Interpretation and management of intrapartum FBS results**

| Result | | Interpretation | Action |
|---|---|---|---|
| pH | Lactate | | |
| ≥ 7.25 | < 4.2 | Normal | Repeat in 1 hour if the CTG abnormally persists, or sooner if required |
| 7.21 – 7.24 | 4.2 – 4.8 | Borderline | Pre-acidaemia. Repeat in 30 minutes, or consider delivery if a significant fall has occurred since the previous sample |
| ≤ 7.2 | 4.9 or more | Abnormal | Acidaemia – imminent delivery is indicated |
| | | | |

**Note**: If FBS obtains both pH and lactate, clinical management plans should be formulated upon whichever is the most abnormal result.

**Escalation of contraction pattern**
The classification of the CTG is not altered by the contraction pattern status however first aid actions must be taken to address amber or red contraction patterns to avoid fetal harm (see Table 3 below).

**Table 3– Escalation of abnormal contraction patterns**

| CTG | Contraction pattern | Escalation required |
|---|---|---|
| **Green Normal** | • 0-4 contractions in 10 mins<br>• Weak/Moderate/Strong strength to palpate<br>• Lasting 30-90secs<br>• Resting tone greater than 60 secs. | Nil escalation required. |
| **Amber Abnormal** | • Contractions lasting longer than 90secs with at least a 60 second rest period between<br>• Tachysystole = more than 4 contractions in 10 mins. | • Senior midwife or Obstetric doctor review required<br>• Decrease syntocinon and observe response |
| **Red Abnormal** | • Hypertonus- Contractions either lasting more than 90 seconds or occurring with less than 60 second rest period between.<br>• Hyperstimulation = oxytocin related tachysystole or hypertonus. | • Urgent Obstetric review required.<br>• STOP syntocinon and consider tocolysis. |

**K2 INFANT-Guardian® System – downtime procedure**
- Interpretation and documentation of CTG findings should occur at the bedside by both clinician's, if possible.
- Antenatal CTG's: The standardised WACHS CTG sticker should be placed on the front/back of the actual CTG trace and then stored as per local practices i.e. paper based or electronic.
- Intrapartum CTG's: The standardised WACHS CTG reporting sticker (Appendix 6) is to be used in the woman's medical record by both clinicians on each occasion of review as per Appendix 7.
- The standardised WACHS CTG sticker needs to be completed:
  - every 30 minutes by the primary midwife caring for that woman, and
  - by both clinicians performing a 'fresh eyes' review every 2 hours, and
  - any time a significant change occurs in the CTG
  - anytime a second review is undertaken
- Down time process for obtaining second clinician review at one midwife sites as per Appendix 7

## 3. Roles and Responsibilities

**Regional Nursing and Medical Directors** are to ensure that all midwifery and obstetric medical staff have read and understood this policy.

**All midwives and obstetric doctors** are to follow this policy when performing and/or classifying CTGs.

**Line managers** are to ensure midwives and Obstetric doctors meet the requirements of the WACHS CTG education policy (Appendix 8).

# 4. Monitoring and Evaluation

## 4.1 Monitoring

Maternity managers are to ensure there is a clinician allocated to audit compliance with this policy via:

- routine review of all cases of Apgar's <7 at 5, newborns requiring resuscitation at birth, abnormal cord blood gases and abnormal fetal blood scalp samples for FHR monitoring care delivery problems
- monitor, investigate and escalate any clinical incidents where the CTG was identified as a contributing factor
- undertaking the WACHS In-MATernity audit tool (found on the WACHS Safety and Quality Clinical Audit page). Where gaps are identified in CTG documentation, the specific CTG audit tool (housed in the WACHS Data Collection tool) can be used to drill down on care delivery issues.
- report audit results to the local Obstetric governance committee and the WACHS Obstetric Leadership Group.

## 4.2 Evaluation

The WACHS Electronic Fetal Heart Rate Monitioring Policy will be evaluated by the Obstetric Leadership group and Midwifery Advisory Forum.

# 5. Compliance

Failure to comply with this policy may constitute a breach of the WA Health Code of Conduct (Code). The Code is part of the Integrity Policy Framework issued pursuant to Section 26 of the *Health Services Act 2016* and is binding on all WACHS staff which for this purpose includes trainees, students, volunteers, researchers, contractors for service (including all visiting health professionals and agency staff) and persons delivering training or education within WACHS.

WACHS staff are reminded that compliance with all policies and procedures is mandatory.

# 6. References


1. Western Australian Government Department of Health (2021) Cardiotocography Monitoring Policy Perth Australia [Accessed 13 July 2022]
2. Cochrane Library (2017) (1): CD005122. Cardiotocography versus intermittent auscultation of fetal heart on admission to labour ward for assessment of fetal wellbeing [Accessed 13 July 2022]
3. The Royal Australian and New Zealand College of Obstetricians and Gynaecologists (2019) Intrapartum Fetal Surveillance Clinical Guidelines (4th edition)
4. Mater Health (2020) Fetal heart rate monitoring (including downtime processes) – procedure. Misericordiae Ltd, Newstead QLD
5. King Edward Memorial Hospital (2020) Fetal Heart Rate Monitoring Clinical Practice Guideline
6. Women and Newborn Health Service (2021) Fetal compromise (acute): Management if suspected [Accessed 13 July 2022]

7. King Edward Memorial Hospital (2019) Cardiotocography (CTG) Monitoring Mandatory education requirements for midwives and medical practitioners-procedure
8. Fiona Stanley Hospital (2018) Fetal Surveillance Policy
9. K2 Medical Systems Ltd (2019) K2MS CTG Surveillance Bedside Functional Guide Rev.01. Devon UK
10. K2 Medical Systems Ltd (2019) K2MS INFANT Functional Guide Rev.01. Devon UK

## 7. Definitions

| Term | Definition |
|---|---|
| **Guardian™ system** | Communicates INFANT® around the health service network so that all monitoring can be viewed at central stations, offices or remotely from home, private practice or the command centre to ensure all CTGs of concern are flagged to experts wherever they may be[9] |
| **INFANT®** | (**IN**telligent **F**etal **A**ssessme**NT**) System has been validated on databases of several thousand interesting, abnormal and challenging traces and been found to perform at the level of experts whose ability have been measured[10] |
| **K2 INFANT-Guardian® System** | An electronic CTG system (Guardian) with artificial intelligence software (INFANT) to support interpretation of the CTG at the bedside[9] |
| **Level 3 CTG Practitioner** | Midwives and Obstetric Practitioners that have achieved Level 3 CTG Practitioner status, which includes:<br>• RANZCOG Fetal Surveillance Education Program (FSEP) face to face program – achieving score >75%, or<br>• K2 Online Fetal Monitoring Training (all seven modules) – 80% or more; or<br>• Completion of OFSEP Certificate **AND** Completion of Individualised Education Sessions with sign off from local SDM/ CMC/ CMS/ CME |

## 8. Document Summary

| | |
|---|---|
| **Coverage** | WACHS |
| **Audience** | Clinical |
| **Records Management** | Clinical: Health Record Management Policy |
| **Related Legislation** | *Health Services Act 2016* |
| **Related Mandatory Policies / Frameworks** | Cardiotocography Monitoring Policy - MP 0076/18<br>Information Security Mandatory Policy - MP 0067/17<br>Clinical Governance, Safety and Quality Policy Framework |
| **Related WACHS Policy Documents** | WACHS Maternity Care Clinical Conflict Escalation Pathway Policy |
| **Other Related Documents** | WA Health Cardiotocography Monitoring Standard<br>WNHS Fetal compromise (acute): Management if suspected<br>WNHS Fetal heart rate monitoring |
| **Related Forms** | Nil |
| **Related Training Packages** | Fetal Monitoring for WACHS Midwives<br>Fetal Monitoring for WACHS Obstetricians<br>Fetal Blood Sampling |
| **Aboriginal Health Impact Statement Declaration (ISD)** | ISD Record ID: 2010 |
| **National Safety and Quality Health Service (NSQHS) Standards** | 5.07, 8.02, 8.06 |
| **Aged Care Quality Standards** | Nil |
| **National Standards for Mental Health Services** | Nil |

## 9. Document Control

| Version | Published date | Current from | Summary of changes |
|---|---|---|---|
| 5.00 | 08 August 2022 | 08 August 2022 | Updated to reflect the introduction of the K2 INFANT – Guardian System.<br>• Full Electronic data capture in the K2 INFANT-Guardian® System<br>• INFANT concern state<br>• Paper CTG and sticker documentation will not be required unless in downtime procedure<br>• WACHS CTG classification algorithm (Green, Blue, Amber, Red) predicting probability of fetal compromise to assist clinical staff with CTG interpretation.<br>• CTG review and classification is to be recorded into the K2 INFANT – Guardian® System by each reviewing clinician<br>• Remote access for Doctors to review CTGs outside the birthing room<br>• Indications for Fetal Scalp Electrode Indications for Fetal Blood Sampling |
| 5.01 | 16 February 2023 | 08 August 2022 | • Amendment to L3 Practitioner status definition adding requirement for completion of Individualised Education sessions to OFSEP Certification option (See Definitions and revised Appendix 8A)<br>• Revision of notification/escalation requirement for second clinician review at Appendix 4 and 5 - from AND to OR i.e. notify Doctor **or** Senior Midwife **or** MOETS) |

## 10. Approval

| | |
|---|---|
| **Policy Owner** | ED Nursing and Midwifery Services |
| **Co-approver** | EDMS, EDCE |
| **Contact** | WACHS Coordinator of Midwifery |
| **Business Unit** | Midwifery |
| **EDRMS #** | ED-CO-14-25314 |



**This document can be made available in alternative formats on request.**

## Appendix 1: Clinical indications for CTG[3,4]

| ANTENATAL or INTRAPARTUM | |
|---|---|
| • Abnormal antenatal Doppler flows (umbilical artery velocimetry)<br>• Abnormal fetal heart rate on auscultation<br>• Oligohydramnios (MVP < 2) or Polyhydramnios (MVP > 8)<br>• Persistent abnormal antenatal CTG<br>• Suspected or confirmed intrauterine growth restriction (IUGR)<br>• Maternal (essential) hypertension/ pre-eclampsia<br>• Antepartum haemorrhage<br>• Multiple pregnancy<br>• Breech presentation<br>• Hypertension, including essential hypertension or pre-eclampsia<br>• Diabetes where medication is indicated or poorly controlled, or with fetal macrosomia<br>• Known fetal abnormality which requires monitoring<br>• Abnormalities of maternal serum screening associated with an increased risk of poor perinatal outcome<br>• BMI ≥40<br>• Abnormal cord insertion<br>• Maternal medical conditions constituting a fetal risk (eg cholestasis, isoimmunisation, substance abuse) | |
| **ANTENATAL** | **INTRAPARTUM** |
| • Altered fetal Movements (unless wellbeing demonstrated on CTG/ USS or return to normal FMs)<br>• Pre and post external cephalic version<br>• Prolonged Pre-labour RoM (> 24 hours)<br>• Threatened preterm labour<br>• Abdominal trauma<br>• Abnormal maternal screening associated with fetal compromise i.e. low PAPP -A <0.4MoM | • Persistent altered fetal movements in week prior to labour commencing<br>• Abnormal presentation (breech or transverse)<br>• Prolonged ROM (> 24 hours)<br>• Preterm labour less than 37 completed weeks<br>• Uterine scar (previous caesarean section) once contractions are regular and painful (regardless of dilatation)<br>• Abnormal vaginal bleeding |

| | |
|---|---|
| • Prolonged pregnancy (≥ 41 weeks)<br>• Rhesus isoimmunisation<br>• Prolonged latent phase of labour (more than 12 hours with regular contractions but not reached 4 cm) | • Prolonged 1st stage (>12 hours once Cx 4 cm and with regular contractions) |

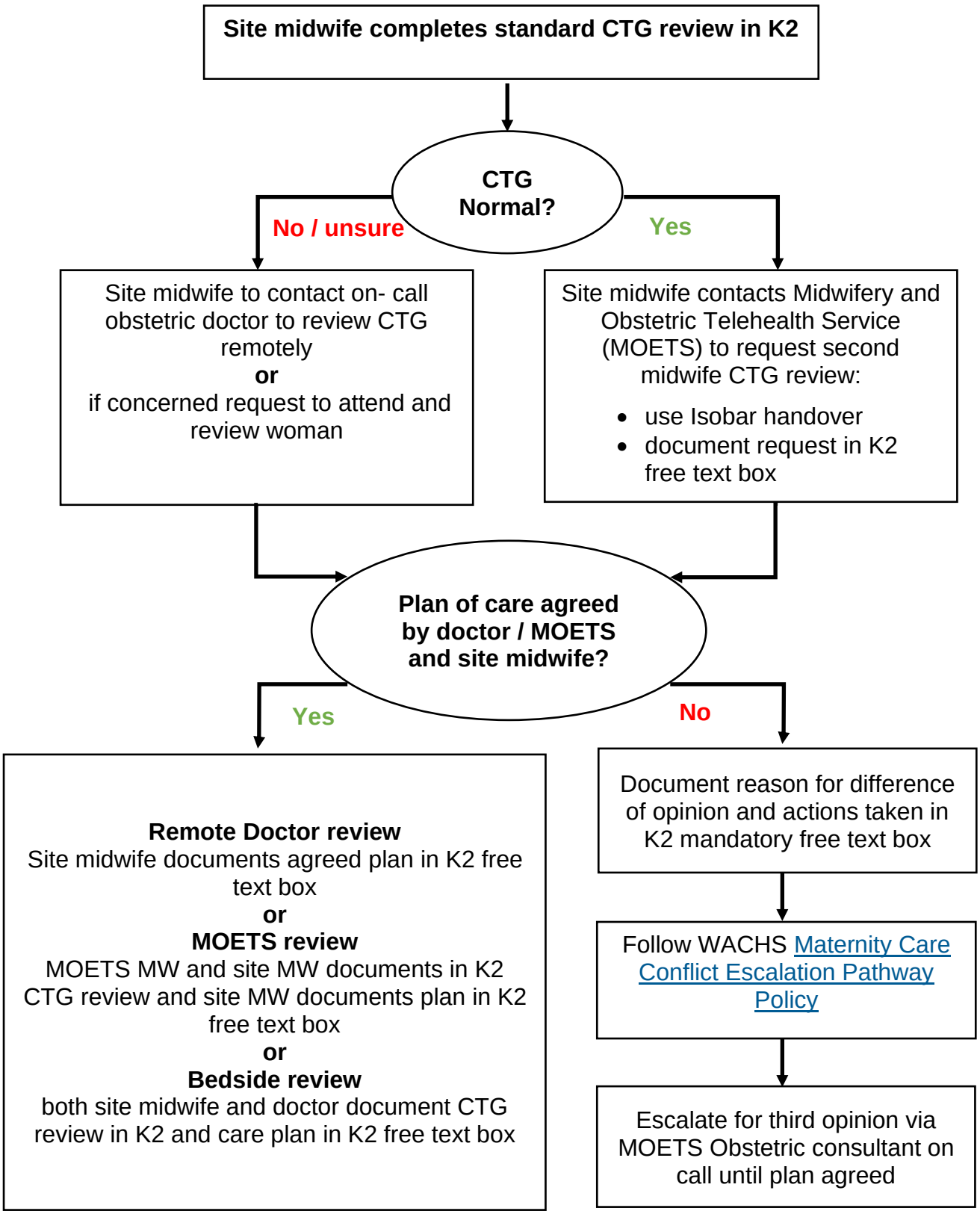
**INTRAPARTUM**

- Abnormal cerebroplacental ratio
- Prolonged 2nd stage (pushing > 1 hour & birth not imminent)
- Induction with prostaglandin or oxytocin
- Oxytocin augmentation
- Meconium or blood-stained liquor
- Absent liquor following amniotomy
- Maternal age ≥ 42
- Fever ≥ 38 C
- Abnormal vaginal bleeding in labour
- Regional anaesthesia (epidural/ spinal/ paracervical) perform prior to block insertion to establish baseline features
- **Tachysystole**: more than five (5) active labour contractions in ten (10) minutes, without fetal heart rate abnormalities.
- **Uterine Hypertonus** - (contractions lasting more than 90 seconds or within 60 seconds of each other without fetal rate abnormalities)
- **Uterine hyperstimulation** either - Tachysystole or uterine hypertonus with fetal heart rate abnormalities

**Consider INTRAPARTUM if more than one of the below presents:**

- Gestation 41 – 41+6 weeks
- Gestational hypertension
- Maternal age >40 – 42 years
- Fever 37.8C – 38C
- Gestational diabetes mellitus without complication
- BMI 30 – 40
- AFI 5-8cm (or MVP 2-3cm)

## Appendix 2: Process for obtaining second clinician review at one midwife sites



## Appendix 3: Antenatal Classification and Escalation Pathway

<table>
<tr><th colspan="3">Classification</th><th>Baseline</th><th>Variability</th><th>Deceleration</th><th>Acceleration</th><th>Action</th></tr>
<tr><td>Normal</td><td>Low Probability of fetal Compromise</td><td>Green</td><td>110-160bpm</td><td>6-25bpm</td><td>Absent.</td><td>2 in 20 minutes</td><td>Obstetric team determines the frequency or necessity of preforming a repeat CTG according to maternal and fetal condition.</td></tr>
<tr><td rowspan="4">Abnormal</td><td>Unlikely fetal compromise</td><td>Blue</td><td></td><td>Less than 5bpm for less than 30min.</td><td>Early or Variable</td><td>Less than 2 accelerations in less than 20 mins.</td><td rowspan="4">• Notify doctor and senior midwife (Or MOETS) for 2nd Clinician Review.<br>• Review clinical picture<br>• Treat reversible causes.<br>• Consider ultrasound assessment<br>• Consider Feto-Maternal Haemorrhage (FMH) if suspected sinusoidal.</td></tr>
<tr><td rowspan="2">May indicate fetal compromise</td><td rowspan="2">Amber</td><td>100-109bpm</td><td>• Less than 5bpm for greater than 30 mins.<br>• Increased by 25bpm for greater than 30mins.</td><td>• Late Decelerations.<br>• Complicated Variable Decelerations.<br>• Prolonged Decelerations.</td><td rowspan="2">No accelerations present</td></tr>
<tr><td colspan="3">More than one (1) amber feature OR persistent amber despite first aid = Red</td></tr>
<tr><td>Likely Significant fetal compromise</td><td>Red</td><td>• Less than 100bpm.<br>• Greater than 160bpm.</td><td>• Less than 3bpm for 30 mins.<br>• Sinusoidal.</td><td>• Sinusoidal.<br>• Bradycardia - FHR less than 100bpm for greater than 5 mins.</td><td>No accelerations present</td></tr>
</table>

## Appendix 4: Intrapartum Classification and Escalation Pathway

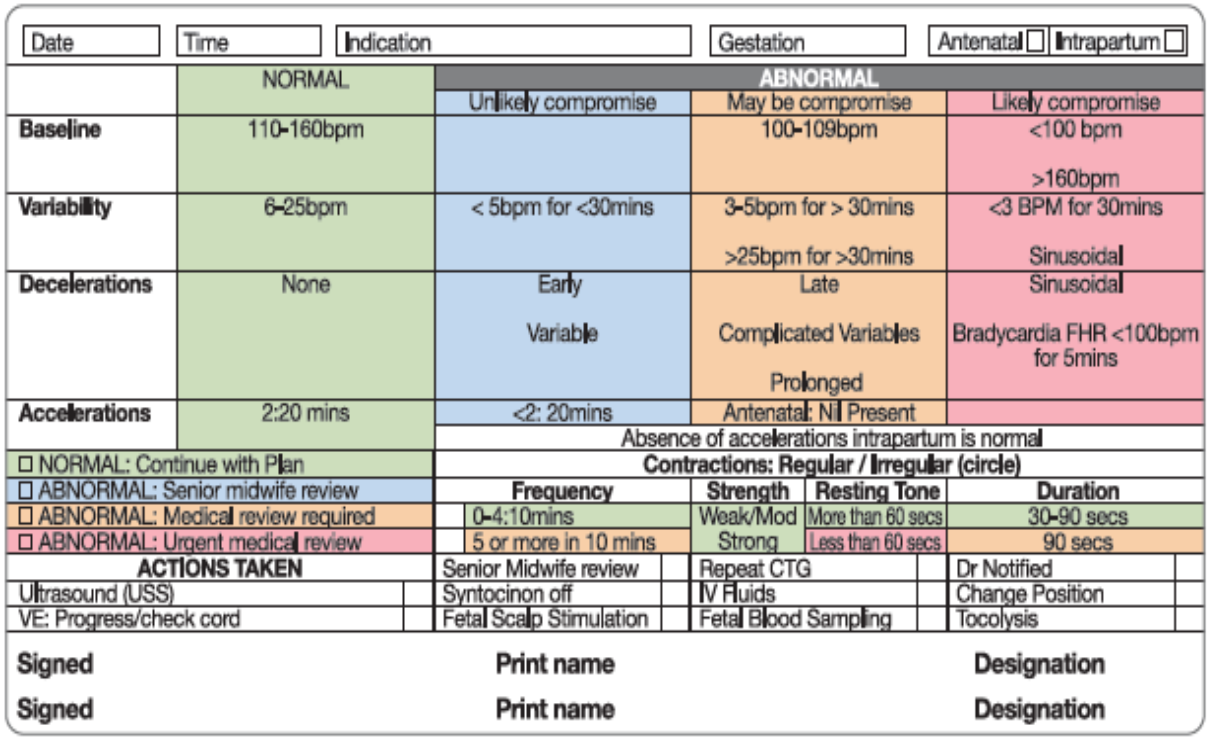
| Classification | | | Baseline | Variability | Contractions | Deceleration | Action |
|---|---|---|---|---|---|---|---|
| **Normal** | Low probability of fetal Compromise | **Green** | 110-160bpm | 6-25bpm | • 0-4 contractions in 10mins<br>• Weak/Moderate/Strong strength to palpate<br>• Lasting 30-90 sec<br>• Resting tone greater than 60secs | Absent | Nil |
| **Abnormal** | Unlikely fetal compromise | **Blue** | | Less than 5bpm for less than 30min | | Early or Variable | • Notify Senior Midwife **OR** MOETS **OR** Obstetric Doctor for 2nd clinician review<br>• Continue CTG<br>• Review clinical picture<br>• Treat reversible cause<br>• +/- scalp stimulation or FBS<br>• Review in 30 mins<br>• Consider IV hydration |
| | May indicate fetal compromise | **Amber** | 100-109bpm | • Less than 5bpm for greater than 30 mins<br>• Increased by 25bpm for greater than 30mins | • Contractions lasting longer than 90 secs | • Late Decelerations<br>• Complicated Variable Decelerations<br>• Prolonged Decelerations | • Notify doctor and Senior Midwife (Or MOETS) for 2nd clinician review<br>• Continue CTG<br>• Review clinical picture<br>• Treat reversible causes<br>• Scalp stimulation+/- FBS<br>• VE to assess progress<br>• Review management- birth may be indicated |
| | | | More than one (1) amber feature OR persistent amber despite first aid = **Red** | | | | |
| | Likely Significant fetal compromise | **Red** | Less than 100bpm<br>greater than 160bpm | Less than 3bpm for 30 mins<br>Sinusoidal | • Tachysystole- greater than 4 contractions in 10mins<br>• Hypertonus- contractions either lasting more than 90secs or occurring with less than a 60 sec rest period<br>• Hyperstimulation- Oxytocin related tachysystole or hypotonus associated with abnormal FHR pattern | • Sinusoidal<br>• Bradycardia- FHR less than 100bpm for greater than 5 mins | • Immediate notification to Doctor and Senior midwife (Or MOETS) for 2nd clinician review<br>• As above<br>• Consider tocolysis<br>• Early assisted birth<br>• Reduce second stage or Category 1 (urgent) Caesarean Section |

## Appendix 5: Antenatal and Intrapartum Reversible Causes plus Review and Management

<table>
<tr><th colspan="5">Antenatal and Intrapartum Reversible Causes and Management</th></tr>
<tr><td>GREEN</td><td colspan="4">• Discontinue antenatal CTG after 20mins if clinically indicated<br>• Document description of CTG including all features of the CTG in K2 INFANT-Guardian® System<br>• Obtain 2nd clinician review prior to discharge from K2 INFANT-Guardian® with plan of care<br>• Doctor to review when/if appropriate<br>• Plan of care for ongoing fetal surveillance to be documented</td></tr>
<tr><td rowspan="4">BLUE or AMBER</td><td>Assess quality of CTG Tracing<br>• External transducer providing adequate CTG?<br>• Consider if CTG is maternal trace<br>• Consider Women’s position<br>• FSE not working or detached</td><td>Assess uterine activity<br>• Has mother recently received prostaglandins?<br>• Is hypercontractibility present?<br>• Assess for abruption or infection if unexplained uterine activity</td><td>Assess maternal factors<br>• Maternal position<br>• Pulse BP and Temperature<br>• Hydration status<br>• Review medications recently administered<br>• Abdominal palpation/assessment<br>• Vaginal examination if indicated</td><td rowspan="2">Other factors to consider<br>• Gestational age<br>• Consider stage/progress of labour<br>• Risk factors for fetal compromise<br>○ Placental<br>○ Infection<br>• Review preceding CTG<br>• Consider causes of new changes in CTG<br>○ Abruption<br>○ Rupture<br>○ Cord prolapse<br><br>BLUE CTG - Escalate to Senior Midwife OR MOETS OR Obstetric Doctor for second clinician review or if at one midwife site follow process for obtaining a second clinician review<br>AMBER CTG - Escalate to doctor and senior midwife (Or MOETS) for second clinician review or if a one midwife site follow process for obtaining a second clinician review</td></tr>
<tr><td>• Check and record maternal HR, consider maternal pulse oximetry<br>• Check position of transducer<br>• Confirm FHR with real time USS if there is any doubt that FH is being recorded<br>• Consider application of FSE</td><td>• Consider tocolysis<br>• Consider reducing oxytocin infusion<br>• Remove prostaglandin from vagina</td><td>• Reposition, encourage left lateral position<br>• Consider fluid therapy<br>• If temperature greater 38, consider screening/treatment for infection<br>• Anaesthetic review if epidural related hypotension</td></tr>
<tr><td colspan="4">If trace remains BLUE, continue to observe for further deterioration and consider other clinical factors</td></tr>
<tr><td colspan="4">If trace remains AMBER despite reversible causes being addressed, trace becomes RED</td></tr>
<tr><td>RED</td><td>Call for assistance<br>• Encourage mother to adopt left lateral position<br>• Call for urgent medical and senior midwife review</td><td>Transfer<br>• If remote CTG review- document agreed plan in K2 free text box and consider transfer to regional site<br>• Call appropriate area Birth Suite/Theatre<br>• Re-apply CTG after transfer</td><td>• IV Access<br>• Take blood for Group and Hold<br>• Check BP<br>• Consider fluid therapy</td><td>Consider FBS or delivery depending on clinical situation</td></tr>
</table>

## Appendix 6: Downtime CTG interpretation sticker

Order via iProc: **UCN 54292Y** "WACHS CTG BIRTHING LABEL"



| Date | Time | Indication | Gestation | Antenatal ☐ Intrapartum ☐ |
|---|---|---|---|---|

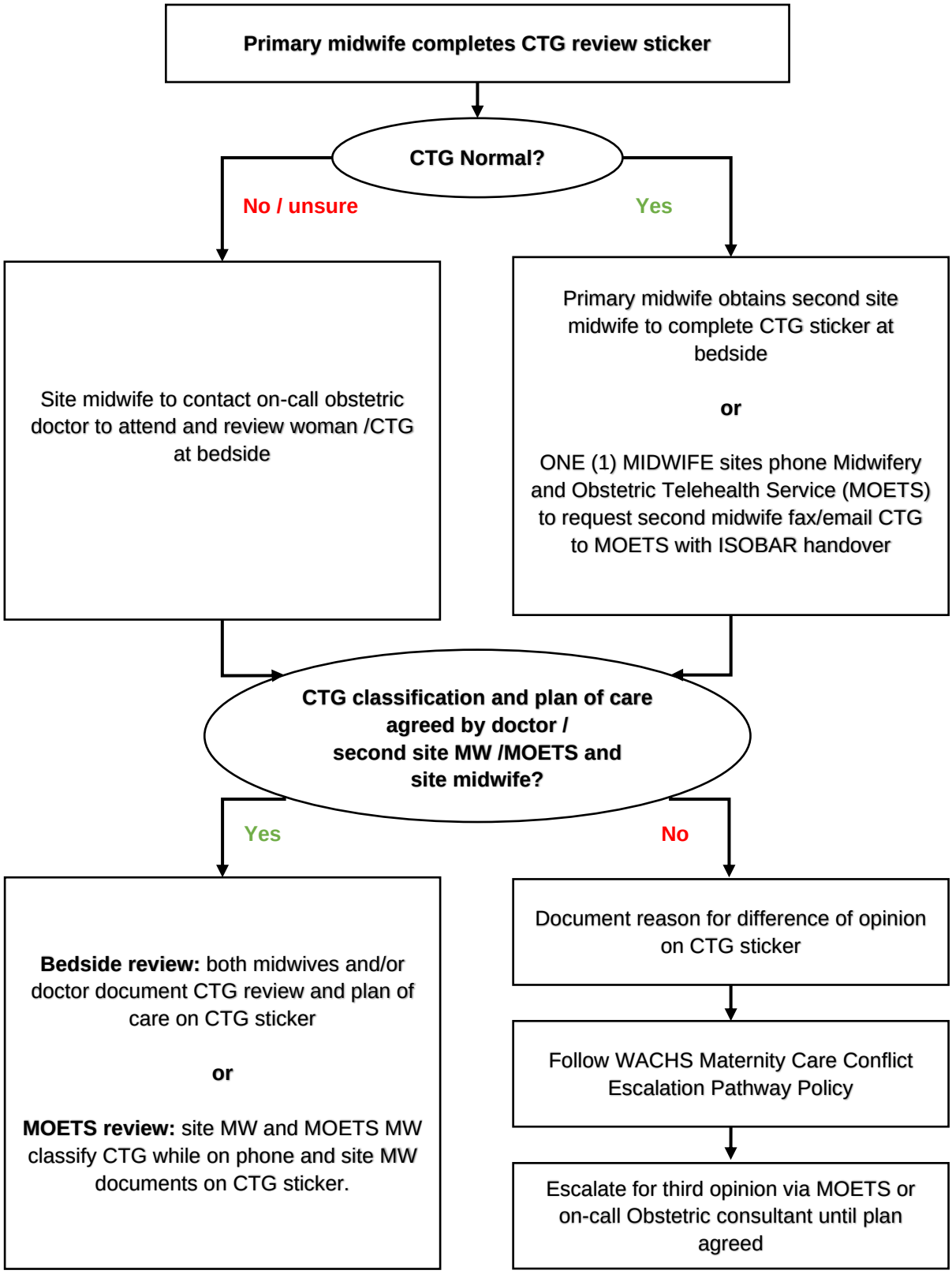
| | NORMAL | ABNORMAL | | |
|---|---|---|---|---|
| | | Unlikely compromise | May be compromise | Likely compromise |
| **Baseline** | 110-160bpm | | 100-109bpm | <100 bpm<br>>160bpm |
| **Variability** | 6-25bpm | < 5bpm for <30mins | 3-5bpm for > 30mins<br>>25bpm for >30mins | <3 BPM for 30mins<br>Sinusoidal |
| **Decelerations** | None | Early<br>Variable | Late<br>Complicated Variables<br>Prolonged | Sinusoidal<br>Bradycardia FHR <100bpm for 5mins |
| **Accelerations** | 2:20 mins | <2: 20mins | Antenatal: Nil Present | |
| | | Absence of accelerations intrapartum is normal | | |

| | | | | |
|---|---|---|---|---|
| ☐ NORMAL: Continue with Plan | **Contractions: Regular / Irregular (circle)** | | | |
| ☐ ABNORMAL: Senior midwife review | **Frequency** | **Strength** | **Resting Tone** | **Duration** |
| ☐ ABNORMAL: Medical review required | 0-4:10mins | Weak/Mod | More than 60 secs | 30-90 secs |
| ☐ ABNORMAL: Urgent medical review | 5 or more in 10 mins | Strong | Less than 60 secs | 90 secs |

| **ACTIONS TAKEN** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ultrasound (USS) | ☐ | Senior Midwife review | ☐ | Repeat CTG | ☐ | Dr Notified | ☐ |
| VE: Progress/check cord | ☐ | Syntocinon off | ☐ | IV Fluids | ☐ | Change Position | ☐ |
| | | Fetal Scalp Stimulation | ☐ | Fetal Blood Sampling | ☐ | Tocolysis | ☐ |

| | | |
|---|---|---|
| **Signed** | **Print name** | **Designation** |
| **Signed** | **Print name** | **Designation** |

# Appendix 7: Downtime Process for Obtaining Second Clinician Review at One Midwife Sites



# Appendix 8: Mandatory CTG Education

**Purpose**

To confirm the minimum mandatory CTG education requirements for midwives and Obstetric medical practitioners with a responsibility for performing or interpreting CTGs in order to adhere to the WA Health Cardiotocography Monitoring Policy - MP 0076/18 and Cardiotocography Monitoring Standard:

All midwives and Obstetric medical practitioners must meet the minimum mandatory education requirements outlined below:

| **Orientation/Initial Requirements** | |
|---|---|
| **Midwives and Obstetric Medical Practitioners (Clinicians)** | |
| On commencement and prior to undertaking responsibility for CTGs | • Orientation to WA Health CTG Monitoring Policy & Standard<br>• Orientation to the WACHS Electronic Fetal Heart Rate Monitoring Policy<br><br>Orientation to K2 Infant Guardian system – certificate as evidence of completion<br>Confirmation of any recognised prior learning (RPL) in the previous three (3) years:<br><br>• Fetal Surveillance Education Program (FSEP) face to face program – to Level 3 (L3) practitioner level<br>**OR**<br>• Online Fetal Education Surveillance Program (OFSEP)<br>**OR**<br>• K2 Online Fetal Monitoring Training (all seven modules) |

| Ongoing education requirements | |
|---|---|
| **Every 3 years** | **Every year** |
| RANZCOG FSEP – F2F program. Clinicians are required to attain a score greater than 75% or more to be a Level three (3) practitioner.<br><br>**NOTE**: if no F2F FSEP programs available, alternative options are:<br><br>OFSEP online program – Evidence of certificate needed as proof of completion **AND** Completion of Individualised Education Sessions with sign off from local SDM/ CMC/ CMS/ Central Office CME<br><br>**OR**<br>Completion of all seven K2 Fetal Monitoring Training modules with a score of 80% or more in the assessment tool | Annual attendance at two multidisciplinary CTG skills sessions either face to face locally or via WACHS Maternity Education Telehealth sessions<br><br>**AND**<br>Score of 80% or more in the K2 Assessment Tool<br><br>**OR**<br>Completion of K2 training simulator - 5 cases<br><br>**OR**<br>OFSEP online program – Evidence of certificate needed as proof of completion |

All WACHS Midwives and Obstetric practitioner must achieve Level 3 CTG practitioner status and is defined as:

- FSEP /OFSEP score >75%, or
- Completion of all seven K2 Fetal Monitoring Training modules with a score of 80% or more in the assessment tool or
- Completion of OFSEP – certificate as evidence needed as proof of completion **AND** Completion of Individualised Education Sessions with sign off from local SDM/ CMC/ CMS/ Central Office CME

**Where a clinician does not meet Level 3 practitioner status, as defined by FSEP, they must complete one of the following options before continuing to interpret CTG's as a second clinician reviewer:**

See Appendix 8a for Education Management of FSEP Assessment results if Level 3 Practitioner not achieved (Medical/Midwifery)

## Appendix 8A: Education Management of FSEP Assessment results if Level 3 Practitioner not achieved (Medical/Midwifery)