Queensland Clinical Guidelines

Translating evidence into best clinical practice

Maternity and Neonatal **Clinical Guideline**

Intrapartum fetal surveillance (IFS)

Queensland Government

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Acknowledgement

The Department of Health respectfully acknowledges the Traditional Owners and Cultural Custodians of the lands, waters and seas across Queensland. We pay our respects to Elders past and present, while recognising the role of current and future leaders in shaping a better health system.

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- Advising consumers of their choices in an environment that is culturally appropriate and which enables comfortable and confidential discussion. This includes the use of interpreter services where necessary
- Ensuring informed consent is obtained prior to delivering care
- Meeting all legislative requirements and professional standards
- Applying standard precautions, and additional precautions as necessary, when delivering care
- Documenting all care in accordance with mandatory and local requirements

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Flowchart: Mode of fetal heart rate monitoring

Risk factors

Antenatal

Maternal

- Age ≥ 42 years
- Obese class III (BMI ≥ 40 kg/m^2)
- Uterine scar (previous CS or uterine surgery)
- Conditions that pose a risk to intrapartum fetal compromise
  - Current medical or obstetric condition (e.g. cholestasis)
- Any hypertensive disorder requiring medication
- Diabetes where medication indicated or poorly controlled or fetal macrosomia
- Rupture of membranes ≥ 24 hours
- Gestation ≥ 42 weeks

Fetal

- Fetal growth restriction/small for gestation age
- Multiple pregnancy
- Non-cephalic presentation
- Known fetal abnormality requiring monitoring
- Fetal movements altered unless there has been a return to normal fetal movements and demonstrated well-being (CTG with or without ultrasound)

Abnormal findings in pregnancy

- Oligohydramnios/polyhydramnios
- Suspected chorioamnionitis or sepsis
- Antepartum haemorrhage
- Abnormal:
  - Antenatal CTG
  - Doppler umbilical artery velocimetry
  - Placental cord insertion likely to impact fetal compromise in labour (e.g. velamentous insertion)
  - Cerebroplacental ratio (less than 5th centile)

Intrapartum

Maternal

- Pyrexia T ≥ 38^{o}C
- Hypertension ≥ 160/110 on one occasion or ≥ 140/90 on two consecutive readings, 30 minutes apart

Fetal

- PTL < 37/40

Uterine

- Tachysystole/hypertonus/hyperstimulation

Interventions

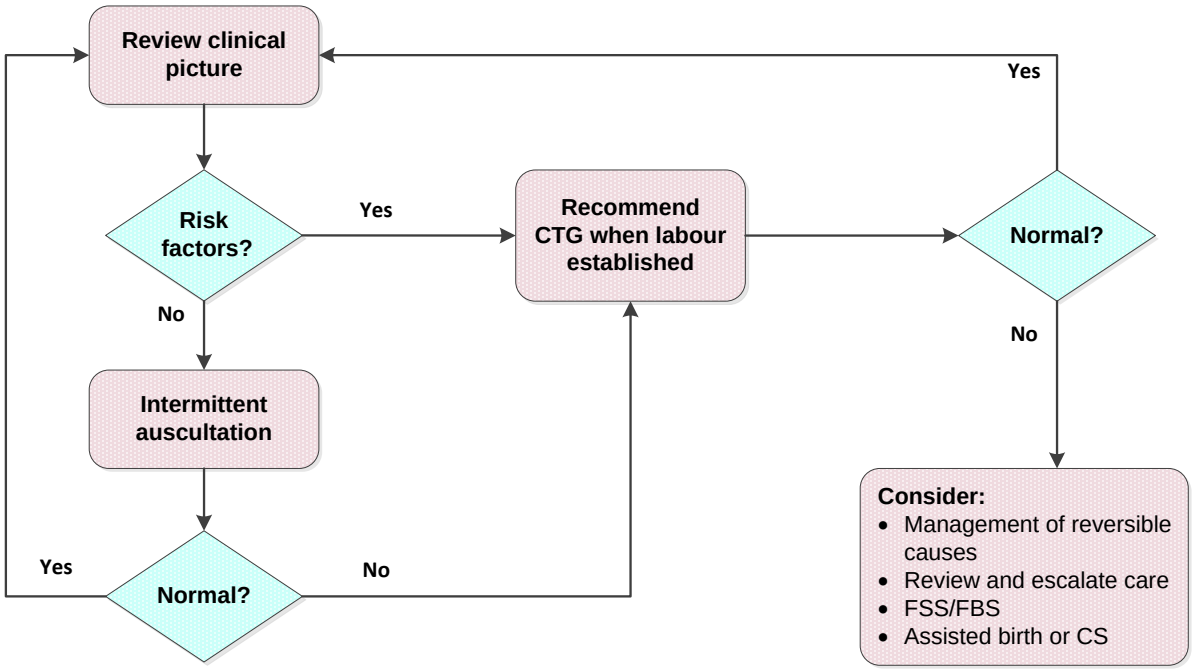
- IOL with prostaglandins/oxytocin
- Oxytocin augmentation
- Regional analgesia (obtain baseline trace prior to insertion)
- Patient controlled analgesia infusion

Abnormal findings in labour

- Suspected chorioamnionitis or sepsis
- Abnormal vaginal bleeding
- Meconium or blood stained liquor
- Absent liquor following amniotomy
- Abnormal FHR detected by IA
- Prolonged active first stage of labour
- Prolonged active 2nd stage where birth not imminent

Two (2) or more risk factors present in labour

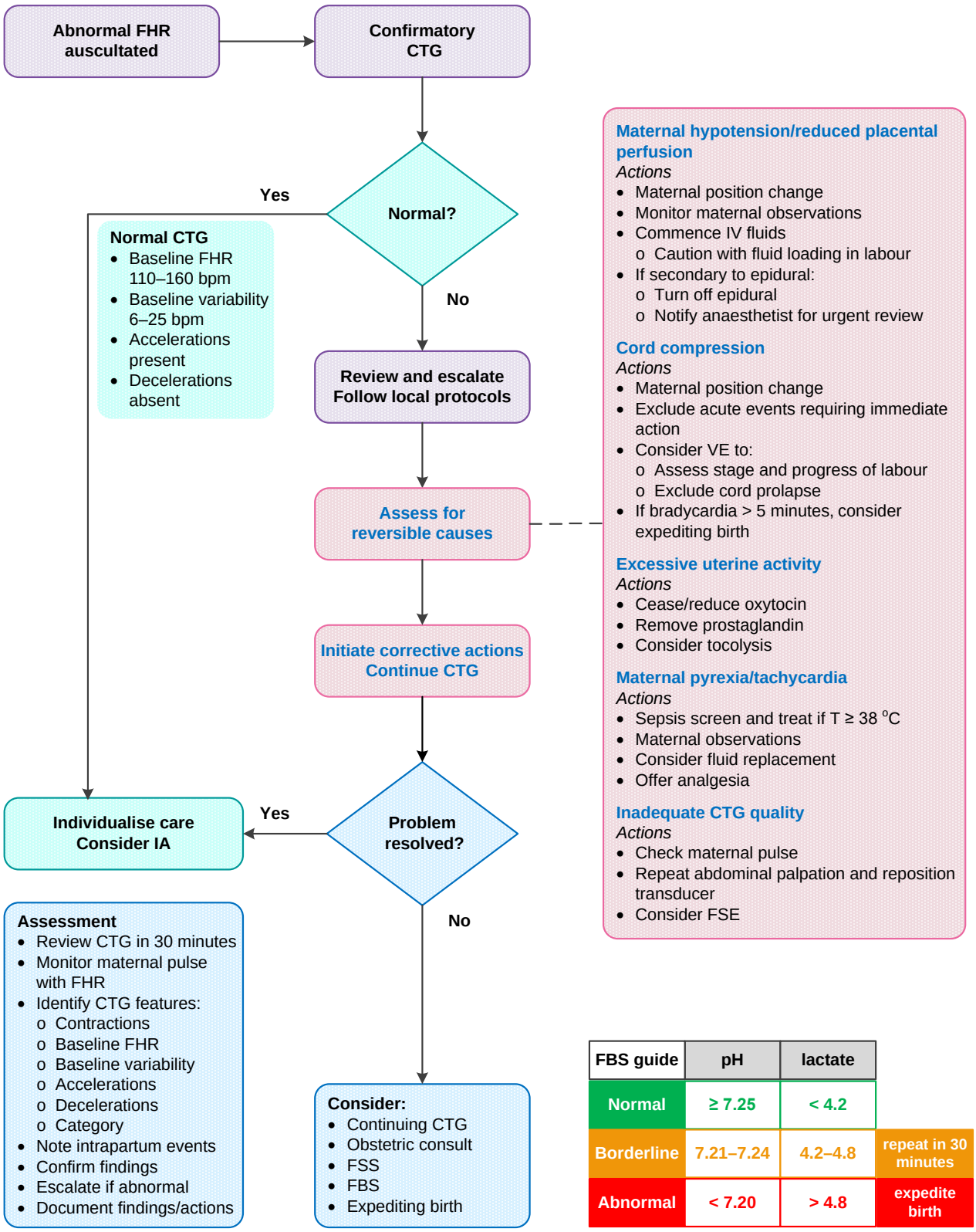
- Gestation 41+0 to 41+6 weeks
- Gestational hypertension
- GDM without complicating factors
- Obesity (BMI 30-39.9 kg/m^2)
- Age ≥ 40 and < 42 years
- Pyrexia T ≥37.8 ^{o}C and <38 ^{o}C



BMI: body mass index, **CS:** caesarean section, **CTG:** cardiotocography, **FBS:** fetal blood sampling, **FHR:** fetal heart rate, **FSS:** fetal scalp stimulation, **GDM:** gestational diabetes mellitus, **IA:** intermittent auscultation, **IOL:** induction of labour, **PTL:** preterm labour, **T:** temperature, **≥:** greater than or equal to, **>:** greater than, **<:** less than

Flowchart: F25.15-1-V7-R30

Flowchart: Abnormal CTG



FBS guide	pH	lactate	
Normal	≥ 7.25	< 4.2	
Borderline	7.21–7.24	4.2–4.8	repeat in 30 minutes
Abnormal	< 7.20	> 4.8	expedite birth

Bpm: beats per minute, **CTG:** cardiotocography, **FBS:** fetal blood sampling, **FHR:** fetal heart rate, **FSE:** fetal spiral electrode, **FSS:** fetal scalp stimulation, **IA:** intermittent auscultation, **IV:** intravenous, **T:** temperature, **VE:** vaginal examination, **≥:** greater than or equal to, **≤:** less than or equal to, **>:** greater than, **<:** less than

Flowchart: F25.15-2-V7-R30

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Abbreviations

bpm	Beats per minute
CS	Caesarean section
CTG	Cardiotocography
FBS	Fetal blood sample/sampling
FHR	Fetal heart rate
FSE	Fetal spiral electrode
FSS	Fetal scalp stimulation
IA	Intermittent auscultation
IFS	Intrapartum fetal surveillance
MHR	Maternal heart rate

Definitions

Early labour (latent first stage)	A period of time, possibly intermittent periods, associated with irregular painful contractions and some cervical effacement and dilatation less than 4 cm.[1]
Established labour (active first stage)	Regular painful contractions and progressive cervical dilatation of at least 4 cm.[1]
Fetal growth restriction	Definitions vary.[2-4] Considered a pathological process whereby the fetus does not reach their growth potential identified by[2]: • Weight less than 3rd centile OR • Weight less than 10th centile with other pathology o Estimated fetal weight/abdominal circumference (AC) below 10th centile o Measurements falling more than two quartiles on centile graphs o Reducing growth velocity o Parameters identified by serial ultrasound (e.g. Doppler studies, amniotic fluid volume)
Obstetrician	Local facilities may, as required, differentiate the roles and responsibilities assigned in this document to an “Obstetrician” according to their specific practitioner group requirements; (e.g. General Practitioner Obstetrician, Specialist Consultant, Senior Registrar or Obstetric Fellow).
Oligohydramnios	Maximal vertical pocket (MVP) less than 2 cm or Amniotic fluid index (AFI) less than 5 cm or as devised by local protocols.[5]
Polyhydramnios	Maximal vertical pocket (MVP) (also known as deepest vertical pocket (DVP)) greater than 8 cm or Amniotic fluid index (AFI) greater than 20 cm or as devised by local protocols.[5]
Small for gestational age	Estimated fetal weight less than 10th centile for sex and age.[6]
Woman/women	QCG recognise that individuals have diverse gender identities. In QCG documents, although the terms woman and women are used, these guidelines are inclusive of people who are pregnant or give birth and who do not identify as female.[7]

1 Introduction

Intrapartum fetal surveillance (IFS) is a screening tool to provide guidance on fetal condition, and not a standalone diagnostic tool.[8] Consider the overall clinical circumstances together with the IFS findings, when recommending care options.[8] This guideline is congruent with and builds on the IFS Clinical Guideline published by the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG).[5]

IFS includes fetal assessment and monitoring by intermittent auscultation (IA) or cardiotocography (CTG). Adjunct testing may include fetal scalp stimulation (FSS) and/or fetal blood sampling (FBS) for indications of metabolic acidosis (pH and/or lactate).

1.1 Clinical practice standards

Table 1. Clinical care

Aspect	Consideration
Standard care	• Refer to Queensland Clinical Guideline: *Standard care*[9] for care considered 'usual' or 'standard' o Includes for example: privacy, consent, decision making, sensitive communication, medication administration, staff education and support, culturally appropriate care
Information sharing and informed decision making	• Ideally commence discussions about IFS during the antenatal period: o All modes of IFS (IA, CTG, adjunct testing) o The evidence, advantages and disadvantages of IFS as they pertain to the individual woman ▪ Refer to Section 2 Risk factors ▪ Refer to Section 3 Fetal heart rate monitoring o Risk assessment is a continual process, and the recommended method of fetal heart rate (FHR) monitoring may change during labour[8] o Recommended management arising from IFS findings • Women may choose to decline all or part of care offered, or to withdraw consent at any time o Refer to Queensland Health guideline: Partnering with the woman who declines recommended maternity care[10] o Support the woman's decision about fetal monitoring during labour o Document these discussions and decisions in the woman's notes[8]
Good practice point	• One to one intrapartum midwifery care[5] • CTG is not a substitute for adequate intrapartum midwifery care[5] • Palpate/monitor maternal heart rate (MHR) simultaneously to differentiate between maternal and FHR regardless of IFS mode[5]
Escalation	• Implement communication pathways for the escalation of concerns regarding fetal wellbeing[5] • Follow local processes for: o Regular independent review of CTG by second clinician o Timely review and escalation of care for abnormal findings of all IFS modes[5,11] • Refer to Section 4.1 Assessment of cardiotocography • Refer to Appendix A: Interpretation of CTG • Refer to Appendix B: CTG definitions and descriptors
Clinician education	• Incorporate recognised IFS education programs to support[12]: o Regular multidisciplinary training and assessment[5] o Understanding of maternal and fetal pathophysiology and available fetal surveillance options[5]

2 Risk factors

There is limited evidence identifying which risk factors are associated with poor outcomes.[5] The risk factors listed are based on other international guidelines[8,13] and derived by consensus of the RANZCOG IFS guideline working party.[5] Recommend CTG to women in labour who have any of the following risk factors.[5] Consider CTG monitoring if, based on clinical assessment and multidisciplinary review, there are concerns about other intrapartum factors not listed below that may lead to fetal compromise.[8]

2.1 Antenatal risk factors

Table 2. Antenatal risk factors

Aspect	Considerations
Maternal[5]	• Maternal age greater than or equal to 42 years • Obese class III—body mass index (BMI) greater than or equal to 40 kg/m^2 o Calculate BMI from weight obtained at booking visit[14] o Reassess if large gestational weight gain • Uterine scar (e.g. previous caesarean section (CS) or uterine surgery) • Conditions that pose a risk to intrapartum fetal wellbeing o Current medical or obstetric condition (e.g. cholestasis) • Any hypertensive disorder requiring medication[8] • Diabetes where medication (insulin or metformin) is indicated; or poorly controlled; or with fetal macrosomia • Rupture of membranes greater than or equal to 24 hours • Gestation greater than or equal to 42 weeks
Fetal[5]	• Fetal growth restriction/small for gestation age o Refer to Queensland Clinical Guideline: *Term small for gestational age newborn baby*[6] • Multiple pregnancy • Non-cephalic presentation • Known fetal abnormality requiring monitoring • Fetal movements altered unless there has been a return to normal fetal movements and demonstrated well-being (CTG with or without ultrasound) o Refer to Queensland Clinical Guideline: *Fetal movements*[15]
Abnormal findings in pregnancy[5]	• Oligohydramnios • Polyhydramnios • Suspected chorioamnionitis or sepsis[8] • Antepartum haemorrhage • Abnormal: o Antenatal CTG o Doppler umbilical artery velocimetry o Placental cord insertion likely to impact fetal compromise in labour (e.g. velamentous insertion)[16] o Cerebroplacental ratio (less than 5th centile)

2.2 Intrapartum risk factors

Table 3. Intrapartum risk factors

Period	Conditions
Maternal	• Maternal pyrexia (greater than or equal to 38 °C)[5] • Maternal hypertension[8] o Systolic greater than or equal to 160 mmHg or diastolic greater than or equal to 110 mmHg on one occasion between contractions *or* o Systolic greater than or equal to 140 mmHg or diastolic greater than or equal to 90 mmHg on two consecutives readings taken 30 minutes apart between contractions
Fetal[5]	• Preterm labour less than 37 weeks
Uterine[5,17]	• Tachysystole • Hypertonus • Hyperstimulation
Interventions	• Induction of labour with prostaglandins/oxytocin[5] • Augmentation of labour with oxytocin[5] • Regional analgesia (epidural or spinal)[5]—obtain baseline trace prior to insertion • Patient controlled analgesia infusion o Refer to Queensland Clinical Guideline: *Intrapartum pain management*[18]
Abnormal findings in labour	• Suspected chorioamnionitis or sepsis[8] • Abnormal vaginal bleeding[5] • Meconium or blood stained liquor[5] • Absent liquor following confirmed amniotomy[5] • Abnormal FHR detected by intermittent auscultation (IA) including: o Baseline less than 110 bpm o Baseline greater than160 bpm o Any decelerations after a contraction • Prolonged active first stage of labour[5] • Prolonged active second stage and birth not imminent[5]: o Refer to Queensland Clinical Guideline: *Normal birth*[1] for definitions of delay in first and second stage
Multiple risk factors[5]	• May have a cumulative and/or synergistic effect • Where two or more of the following are present in labour, recommend CTG: o Gestational hypertension o Gestational diabetes mellitus (GDM) without complicating factors o Obesity (body mass index 30–39.9 kg/m^2) o Maternal age greater than or equal to 40 and less than 42 years o Maternal pyrexia (temperature greater than or equal to 37.8 °C and less than 38 °C) o Gestation 41+0 to 41+6 weeks

3 Fetal heart rate monitoring

3.1 Intermittent auscultation (IA)

Table 4. Intermittent auscultation

Aspect	Consideration
Indication	• Recommend IA to women in established labour at low risk of complications[8,19] • Use IA when there are unavoidable interruptions to the CTG and/or periods of potential fetal vulnerability (e.g. transfer to theatre) o Recommence CTG as soon as possible[5]
Modes	• Hand-held doppler (with speaker mode turned on)[20] o May be more reliable than a Pinard stethoscope for detecting FHR abnormalities[5] • Pinard stethoscope (fetoscope)[20]
Review overall clinical picture	• Current clinical history, observations, progress of labour, parity • Medication history and use • Antenatal and intrapartum risk factors o Refer to Section 2 Risk factors • Individual circumstances, and the woman's values and preferences for fetal monitoring in labour
Assessment[21]	• Abdominal palpation o Confirm fetal lie, position, presentation and descent o Assess liquor volume, fetal growth (symphysiofundal height) • Uterine activity o Palpate contractions—determine onset, duration, frequency, intensity o Note any uterine irritability or tenderness and uterine resting tone between contractions • Fetal movements o Ask about pattern of recent fetal movements • Auscultate fetal heart rate: o Towards the end of a contraction and continue for at least 30–60 seconds after the contraction has finished[5] o For rate and rhythm, accelerations and decelerations • Palpate/monitor MHR simultaneously to differentiate between the maternal and FHR[5]
Recommendation for IA in active labour[21]	• No antenatal or intrapartum risk factors • Cephalic presentation, normal fetal growth and liquor volume • Normal uterine activity and resting tone • FHR o 110 to 160bpm o No decelerations heard o Regular FHR rhythm
Frequency	• Every 15–30 minutes in active first stage[5] • After each contraction or at least every five minutes in active second stage[5] • Refer to Queensland Clinical Guideline: *Normal birth*[1]
Documentation	• Document FHR as a single number[21] o Note any accelerations, decelerations, irregular rhythm heard or significant change to previous documented FHR
Management of abnormal IA findings	• If abnormal FHR detected by IA, recommend CTG • Refer to: o Section 2.2 Intrapartum risk factors o Appendix B: CTG definitions and descriptors o Section 4.6.1 Reversible causes • If CTG trace normal after 20 minutes, consider return to IA[8] • If no fetal heartbeat is detected, recommend urgent real-time ultrasound assessment to check fetal viability[8]

3.2 Cardiotocography

Table 5. Cardiotocography

Aspect	Recommendations
Evidence summary	• The use of intrapartum CTG compared to IA, is associated with: o Reduction in the incidence of neonatal seizures[22] o Higher rates of caesarean section[23] and instrumental births across all risk categories[19,22] o No difference in cerebral palsy rates, infant mortality, neonatal acidosis, low Apgar scores or rates of admission to neonatal nursery[22] o No perinatal benefit in women with low risk of complications in labour[19]
Indication	• If risk factors are identified during established labour [5,8] recommend CTG • Refer to Section 2 Risk factors
Admission CTG	• Insufficient evidence to support routine use for women at low risk of complications in labour[24,25] • Increases the rate of monitoring with CTG[5] • May increase the CS rate[5,24] • May lead to increased interventions without benefit[8,24] • May identify a small number of previously unidentified at risk fetuses where CTG monitoring would not normally be indicated[5]
External CTG (wired)	• Conduct an abdominal palpation to confirm fetal lie, position, presentation and descent for ultrasound transducer placement • External ultrasound transducer monitors FHR • Toco pressure transducer monitors uterine contractions • Both transducers attach to maternal abdomen with elasticised straps • Electronic cables connected from the transducers to the cardiotocograph may limit the mobility of the woman
Telemetry CTG (wireless)	• Uses the same transducers and elasticised straps as external CTG or wireless patch system • May be used in water
Internal CTG (fetal spiral electrode (FSE))	• May be recommended when: o External monitoring is unable to be used o Difficulty obtaining continual FHR tracing via external methods (e.g. during use of birth pool or shower) o Concerns with baseline variability o Presenting twin is cephalic and membranes ruptured • Requires: o Rupture of membranes o Adequate cervical dilation o Cephalic/breech presentation o Relative certainty of fetal presenting part position to avoid placement in fontanelles, eyes, sutures, genitals or other structures • Risks and contraindications—same as for FBS o Refer to Section 5.2 Fetal blood sampling

4 Management of cardiotocography

A standardised approach to the assessment, description, and management of FHR abnormalities results in improved outcomes for women and their babies.[5]

4.1 Assessment of cardiotocography

Table 6. Assessment of cardiotocography

Aspect	Consideration
Systematic method for interpretation[8]	• Determine risk factors • Contractions, baseline FHR, variability, accelerations, decelerations • Classification of CTG trace o Refer to Appendix A: Interpretation of CTG
Review overall clinical picture	• Individual circumstances, and the woman's values and preferences • Current clinical history, observations, progress of labour, parity • History and categorisation of previous CTG traces • Medication history and use • Antenatal and intrapartum risk factors o Refer to Section 2 Risk factors • Discuss findings and support the woman's decisions[8]
Frequency	• Review and record interpretation of CTG trace every 15–30 minutes[5] or earlier if abnormalities are present • Refer to Queensland Clinical Guideline: *Normal birth*[1]
Normal intrapartum CTG features[5]	• Baseline 110–160 bpm • Variability 6–25 bpm • Accelerations present o Significance of no accelerations on an otherwise normal intrapartum CTG is unclear • No decelerations
Abnormal intrapartum CTG features	• All other CTGs are by definition abnormal and further evaluation is recommended • Refer to: o Appendix A: Interpretation of CTG o Section 4.6.1 Reversible causes o Section 4.6.2 Management of abnormal cardiotocography
Second stage of labour	• During active second stage, the fetus is at increased risk of FHR changes associated with decreased fetal oxygenation[13] • Differentiate FHR from MHR[26] • If FHR accelerations noted, these are most likely from MHR[8] • Maintain awareness and: o Take immediate actions to correctly identify FHR and MHR o If there is concern about differentiating between the heart rates recommend maternal digital pulse oximetry; FSE monitoring and/or bedside ultrasound scan o If differentiating between heart rates cannot be achieved, expedite birth[8]

4.2 Multiple pregnancy

Table 7. Multiple pregnancy

Aspect	Consideration
Monitoring	• Assess and document each fetal position • Identify and confirm each FHR and monitor simultaneously • If membranes ruptured, monitor presenting fetus by external ultrasound transducer or FSE and second fetus by external ultrasound transducer • Follow local protocols for correct identification of each fetus
Recording[8]	• Monitor MHR and display it simultaneously with each FHR on CTG • Consider separating the fetal heart rates by 20 bpm to differentiate between them

4.3 Preterm labour

Table 8. Preterm labour

Aspect	Consideration
Physiology of preterm fetus	• Physiological control of FHR and resultant CTG trace, differs compared with the term baby, especially at gestations less than 28 weeks[27] • Has lower reserves and reduced ability to withstand persistent intrapartum insults[27]
Gestation	• The value of FHR monitoring with CTG in preterm fetuses and its contribution to improving outcomes has not been established[28,29] • Not recommended at less than 24 weeks gestation • Limited evidence on interpretation of CTG between 24 weeks and 28 weeks gestation[27,28,30] o Follow local protocols Refer to Queensland Clinical Guideline: *Perinatal care of the extremely preterm baby*[31]
Interpretation of CTG	• Has poor positive predictive value[30] • FHR baseline is often higher in a preterm fetus but is normally within baseline range of 110–160 bpm[5] • Variability may also be reduced due to immaturity of autonomic nervous system[27] • Accelerations may be of lesser amplitude and shorter duration[5] • Decelerations (variable) occur more commonly than in a term fetus • Requires expert clinician input • Variation to interpretation can lead to unnecessary intervention[30] • Before accepting deviations from normal as due only to prematurity, consider[29]: o Degree of prematurity o Concomitant pregnancy or fetal pathology o Fetal damage after hypoxic events occurs earlier than in term fetuses

4.4 Intrauterine pressure catheter

Table 9. Intrauterine pressure catheter

Aspect	Consideration
Context	• Provides timely recognition and assessment of uterine activity to inform interpretation of CTG • Requires: o Compatibility of intrauterine pressure catheter (IPC), cable and CTG monitor o Awareness of placental location o Placement into the amniotic fluid space (i.e. avoiding extraovular placement) o Insertion by experienced clinician
Indication	• May be considered when monitoring of contractions is: o Inhibited by raised body mass index[5] o Unable to be determined by external measures
Contraindications	• Diagnosed or suspected placenta praevia • Vaginal bleeding of undetermined origin • Uterine infection • Uterine anomalies (individual assessment required)
Risks	• Infection • Uterine perforation[32] • Umbilical cord/placental vessel perforation[32] • Cord entanglement[32] • Extra-membranous catheter placement leading to complications[32] (e.g. placental abruption, fetal distress, disseminated intravascular coagulation, and rarely anaphylactoid syndrome[33]) • Postpartum endometritis • Postpartum haemorrhage[33]

4.5 Safety considerations

Table 10. Safety considerations

Aspect	Consideration
Good practice point[5]	• If the preceding CTG is normal and there have not been any interventions that can be expected to alter the FHR, short, infrequent interruptions for personal care may be accommodated • Minimise interruptions to fetal monitoring during transfer to the operating theatre and prior to the birth of the fetus • Minimise disturbances to the woman (e.g. keep monitor volume low and do not restrict mobility and position or the use of water for pain relief) • Monitor MHR simultaneously to differentiate between the maternal and FHR[5] • Commence CTG prior to epidural block to establish baseline features
CTG settings[5]	• Paper speed of 1 cm per minute • Validate date and time settings • Note: different manufacturers use different vertical axis scales and this can change the perception of FHR variability
CTG storage of thermal paper images (when electronic storage not available)	• Keep the original in a labelled envelope with the medical record • Due to the possibility of ink fading on original CTG, include a photocopy of the CTG when: o There has been significant morbidity for the baby related to labour o Neonatal death or intrapartum stillbirth has occurred o Apgar score less than or equal to 5 after 5 minutes o Any birth requiring active resuscitation of neonate, including intermittent positive pressure ventilation by bag and mask or intubation and or cardiac massage
Support systems	• IFS is a complex sociotechnical activity, with tasks, people, tools and technology, organisational, internal and external factors all combining to affect safety[34] • Include CTG interpretation in bedside handovers[35] • Use tools to assist with CTG interpretation and prompt escalation of abnormal traces[35] o Electronic warning alerts o Intrapartum CTG monitoring documentation o A ‘traffic light system’ can assist effective interpretation of a CTG[36] o Refer to Appendix A: Interpretation of CTG • Undertake regular audit and action plans to respond to poor audit results[35]

4.6 Abnormal cardiotocography

In clinical situations where the CTG is considered abnormal, identification and management of reversible causes may prevent unnecessary interventions.[5]

4.6.1 Reversible causes

Table 11. Reversible causes of abnormal cardiotocography

Aspect	Actions
Maternal hypotension/ reduced placental perfusion	• Recommend maternal position change (avoid aortocaval compression) • Check/monitor MHR and blood pressure • Commence intravenous fluids to correct abnormalities in maternal circulation[37] o Exercise caution with fluid loading in labour to prevent maternal fluid overload, electrolyte imbalance and neonatal convulsions due to dilutional hyponatraemia [37] • If secondary to an epidural insertion/top-up[5]: o Cease epidural o Notify anaesthetist for urgent review o Monitor maternal observations
Cord compression	• Recommend maternal position change (avoid aortocaval compression) • Exclude acute events requiring immediate intervention (e.g. placental abruption, uterine rupture, seizure) • Consider vaginal examination (VE) to: o Assess stage and progress of labour o Exclude cord prolapse or presentation • If acute bradycardia or single prolonged deceleration for three minutes or more seek urgent obstetric review[8] • If bradycardia persists for five minutes consider expediting birth[5] • If the FHR recovers at any time up to nine minutes: o Reassess recommendation to expedite the birth, taking into account other antenatal and intrapartum risk factors[8]
Excessive uterine activity (tachysystole or hypertonus or hyperstimulation)	• Cease or reduce oxytocin infusion[5] • Remove prostaglandin[5] o Refer to Queensland Clinical Guideline: *Induction of labour*[38] • Consider tocolysis[5] o Terbutaline: 250 micrograms subcutaneously *or* ▪ Terbutaline is a risk factor for neonatal hypoglycaemia ▪ Refer to Queensland Clinical Guideline: *Hypoglycaemia-newborn*[39] o Sublingual Glyceryl Trinitrate* (GTN) spray 400 micrograms *or* o Salbutamol 100 micrograms IV • Excessive uterine activity in the absence of fetal compromise (tachysystole or hypertonus) is not in itself an indication for tocolysis • If CTG does not normalise with efforts to reduce excessive uterine activity, consider need to recommend expediting birth
Maternal tachycardia or pyrexia	• If temperature greater than or equal to 38 °C, undertake screening and treatment for sepsis • Check maternal observations • If dehydrated/suspected sepsis: commence intravenous fluids[37] • If tachycardia related to pain response, offer analgesia
Inadequate quality of CTG	• Check MHR • Repeat abdominal palpation and reposition external ultrasound transducer and toco pressure transducer • Consider FSE

*Not currently listed on the Queensland Health List of Approved Medications (LAM)

4.6.2 Management of abnormal cardiotocography

Table 12. Management of abnormal cardiotocography

Aspect	Consideration
Additional management	• Continue CTG • If CTG abnormality persists after correcting reversible causes, recommend obstetric review • If in first stage or early second stage (i.e. vaginal birth not imminent) consider: o Fetal scalp stimulation o Fetal blood sampling • Refer to Section 5 Adjunct testing
Expedite birth[5]	• Recommend preparing to expedite birth by instrument or CS where CTG indicates: o Further assessment required and FBS unavailable, contraindicated or declined o Likely significant fetal compromise (e.g. bradycardia for greater than 5 minutes)

5 Adjunct testing

5.1 Fetal scalp stimulation (FSS)

The effect and safety of FSS is unclear and there is limited evidence to establish firm recommendations to inform clinical practice.[40]

Table 13. Fetal scalp stimulation

Aspect	Consideration
Context	• May be considered as an adjunct test to CTG to assess fetal well-being in labour[8,41] • Main purpose is to evaluate reduced variability to distinguish between fetal deep sleep and hypoxia[42] • May reduce use of FBS by 50%[42]
Mode	• Attempts to elicit a sympathetic nervous system response when the fetal scalp is stroked lightly and gently for 15–30 seconds during a vaginal examination[13] o Applying substantial pressure may produce a vagal response and result in deceleration[13] • FSS is based on the assumption that a healthy response leads to an acceleration in FHR[40]
Management	• If following FSS, CTG displays: o An acceleration and a sustained improvement in the CTG trace, continue to monitor the FHR and clinical picture[8] o Absence of an acceleration or acceleration occurs but there is continued reduced variability, additional testing and review is indicated[42]

5.2 Fetal blood sampling (FBS)

There is limited evidence to establish firm recommendations for the use of fetal blood sampling (FBS).[8,43]

Table 14. Fetal blood sampling

Aspect	Considerations
Aim	• To provide additional physiological information • Confirm suspicion of fetal compromise or provide the reassurance needed for labour to continue
Indications	• Consider in the presence of a CTG which remains abnormal despite appropriate corrective actions in first or second stage[13]
Contraindications	• Not generally recommended at less than 34 weeks gestation[5] • CTG suggestive of serious sustained fetal compromise (e.g. prolonged bradycardia greater than 5 minutes)[5] • Inherited bleeding disorders (e.g. haemophilia) or other risk factors for fetal bleeding disorders (e.g. suspected fetal thrombocytopenia) • Non-vertex presentation • Maternal infection (e.g. Human immunodeficiency virus, hepatitis B, hepatitis C, herpes simplex virus with active genital lesions, suspected intrauterine sepsis)[5] o Group B Streptococcus carrier does not preclude FBS[5]
Risks	• Eyelid laceration • Scalp laceration • Neonatal scalp abscess and ulceration • Neonatal subarachnoid penetration • Potential for time delay to expedite birth[5]
Sample collection	• Requires cervix dilated greater than 4 cm and ruptured membranes • Consider using left lateral position or lithotomy with a wedge in place to avoid inferior vena cava syndrome or supine hypotension syndrome[5]
Lactate versus pH	• Either scalp lactate or pH measurement may be used[5] • Scalp lactate may provide an easier and more affordable adjunct to monitoring with CTG for some units[5]
Management	• Interpret taking into account[5]: o Any previous FBS value o Rate of progress in labour o Other clinical circumstances • If the FHR trace remains abnormal despite a normal FBS result, repeat in 30 minutes • If stable FBS after second test (lactate or pH remains unchanged), defer further testing unless there are additional abnormal features[5]

5.2.1 Interpretation of fetal blood sampling results

Table 15. Interpreting fetal blood sampling results

Interpretation[13]	pH (units)	Lactate (mmol/L)
Normal	Greater than or equal to 7.25	Less than 4.2
Borderline: repeat in 30 mins	7.21 to 7.24	4.2 to 4.8
Abnormal: expedite birth	7.20 to 7.14	Greater than 4.8

6 Paired umbilical cord blood gas sampling

Table 16. Paired umbilical cord blood gas sampling

Aspect	Consideration
Context	• Collection and analysis of a paired cord blood gas sample provides evidence of fetal and placental oxygenation at birth[13] • Samples from both vessels are needed to validate the arterial origin[44] • Umbilical artery (UA) blood reflects neonatal acid-base status • Umbilical venous (UV) blood reflects maternal acid-base status and placental function
Indications	• Antenatal o Preterm gestation o Multiple pregnancy • Intrapartum o Intrapartum fever (temperature greater than or equal to 38 °C) o Fetal blood sampling in labour[5] o Intrapartum haemorrhage o Abnormal CTG o Meconium stained liquor o Breech birth o Shoulder dystocia o Operative birth for suspected fetal compromise[5] o All emergency CS • Neonatal o Any baby requiring resuscitation or Apgar score[5,44] ▪ Less than 4 at one minute[5] ▪ Less than 7 at five minutes[5] o Small for gestational age baby/fetal growth restriction • Other at clinician discretion
Sampling techniques	• May include: o Intact cord sampling[13,45-47] *or* o Clamped cord sampling • Follow local procedure for collection
Timing	• Recommend collection as soon as possible after birth[13] • To facilitate optimal cord clamping: o Cord blood can be collected immediately following birth using the intact cord sampling technique o Analyse the sample as soon as possible after collection[48] o Analysis after 20 minutes may render results unreliable[13]
Consideration of other procedures	• Sampling does not need to alter: o Optimal cord clamping timeframes o Neonatal resuscitation procedures ▪ Refer to Queensland Clinical Guideline: *Neonatal resuscitation*[49] o Management of the third stage of labour ▪ Refer to Queensland Clinical Guideline: *Normal birth*[1]

6.1 Analysis of cord blood gas or lactate

Table 17. Analysis of cord blood gas or lactate

Aspect	Consideration
Interpretation	• Confirm a paired sample has been collected o Arterial pH is less than venous pH (by at least 0.02 units)[47,50,51] o Arterial pCO_2 is greater than venous pCO_2 (by at least 5.3 mmHg)[50] • If cord arterial pH is low, the risk of neonatal encephalopathy is increased o A normal pH does not exclude subsequent neonatal morbidity
Reporting	• Follow local protocol for reporting cord blood results to neonatal team/clinician caring for baby • Refer to: o Queensland Clinical Guideline: *Neonatal resuscitation*[49] o Queensland Clinical Guideline: *Hypoxic ischaemic encephalopathy (HIE)*[52]

6.2 Reference ranges for umbilical cord blood gases

Table 18. Reference range cord blood gas and lactate (at birth)

At term	pH	Base Excess (mmol/L)	pO_2 (mmHg)	pCO_2 (mmHg)	Lactate (mmol/L)
UA	7.10 to 7.38	-9.0 to 1.8	4.1 to 31.7	39.1 to 73	Less than 6.1
UV	7.22 to 7.44	-7.7 to 1.9	30.4 to 57.2	14.1 to 43.3	

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Appendix A: Interpretation of CTG

<table>
<tr><th colspan="3">Fetal compromise classification</th><th>Baseline</th><th>Variability</th><th>Decelerations</th><th>Accelerations</th><th>Actions</th></tr>
<tr><td rowspan="1">Normal</td><td>Low probability</td><td>GREEN</td><td>• 110–160 bpm</td><td>• 6–25 bpm</td><td>• Nil</td><td>• Present</td><td>• Nil</td></tr>
<tr><td rowspan="4">Abnormal [2]</td><td>Unlikely significant
when occurring in isolation</td><td>BLUE</td><td>• 100–109 bpm</td><td>• Reduced (3–5 bpm)</td><td>• Early
• Variable</td><td>• Absent[1]</td><td>• Continue CTG
• Obstetric/midwifery review
• Correct reversible causes</td></tr>
<tr><td>May be significant
requiring further action</td><td>YELLOW</td><td>• 160 bpm or rising</td><td></td><td>• Complicated variable
• Late
• Prolonged</td><td></td><td>• Continue CTG
• Obstetric/midwifery review
• Correct reversible causes
• FSS/FBS/review birth timing</td></tr>
<tr><td rowspan="2">Likely significant
requiring immediate action</td><td rowspan="2">RED</td><td colspan="3">≥ 2 YELLOW features = RED</td><td></td><td>Persistent YELLOW = RED</td></tr>
<tr><td>• Bradycardia for > 5 minutes</td><td>• Absent (< 3 bpm)
• Sinusoidal</td><td>• Complicated variable (with reduced or absent variability)
• Late (with reduced or absent variability)</td><td></td><td>• Continue CTG
• Urgent obstetric/midwifery review
• Expedite birth</td></tr>
</table>

NOTES:
Aligned with the classifications from Royal Australian and New Zealand College of Obstetricians and Gynaecologists. Intrapartum fetal surveillance clinical guideline. 2019.
1. Significance of accelerations/no accelerations in an otherwise normal intrapartum CTG is unclear
2. Follow local procedures for timely review and escalation of care for abnormal findings of CTG

bpm beats per minute; **CTG** cardiotocograph; **FBS** fetal blood sample; **FHR** fetal heart rate; **FSS** fetal scalp stimulation; **>** greater than; **≥** greater than or equal to; **<** less than

Flowchart: F25.15-3-V6-R30

Appendix B: CTG definitions and descriptors

Term	Sub-group	Descriptor/range	Assessment
Baseline fetal heart rate[1]	Normal baseline	• 110–160 bpm	• Mean level of the FHR • Determined over 5–10 minutes excluding fetal movements, accelerations, uterine activity and decelerations
	Baseline tachycardia	• Greater than 160 bpm	
	Baseline bradycardia	• Less than 110 bpm	
Baseline variability[1]	Normal variability	• 6–25 bpm at the baseline FHR	• Minor fluctuations around the baseline FHR • Assessed by estimating the difference in bpm between the highest peak and the lowest trough of fluctuation in one minute segments between contractions • The presence of normal baseline variability is the most important feature of the CTG in terms of fetal well-being[3] • Intermittent periods of reduced variability are normal, especially during periods of quiescence ('sleep')[2] • Increased variability refers to oscillations around the baseline FHR of more than 25 beats a minute, and shorter episodes lasting a few minutes may represent worsening fetal condition[2]
	Reduced variability	• 3–5 bpm	
	Absent variability	• Less than 3 bpm	
	Increased variability	• Greater than 25 bpm	
	Sinusoidal	• Oscillating pattern—smooth and regular resembling sine wave • Smooth undulating persistent pattern • Relatively fixed period of 2–5 cycles per minute • Amplitude of 5–15 bpm above and below the baseline • Baseline variability absent • No accelerations	
	Pseudo sinusoidal[3]	• Shares some features of a sinusoidal trace • Hallmark feature of a pseudo sinusoidal trace is the prior or subsequent appearance of normal baseline variability and accelerations • If there is a pseudo sinusoidal trace with risk factors for a sinusoidal pattern, including reduced fetal movements, pain or bleeding, observe carefully for an evolving sinusoidal pattern	
Accelerations[1]		• Transient increases in FHR of 15 bpm or more above the baseline and lasting 15 seconds	• Significance of accelerations/no accelerations in an otherwise normal intrapartum CTG is unclear[3]

Term	Sub-group	Descriptor/range
Decelerations[1]	Transient decreases of FHR below the baseline, lasting for 15 seconds of more, conforming to one of the sub-groups below	
	Early deceleration	• Uniform repetitive decrease of FHR • Slow onset early in the contraction and return to baseline by the end of the contraction
	Variable deceleration	• Repetitive or intermittent decreasing of FHR with rapid onset and recovery • Most commonly occur simultaneously with contractions
	Complicated variable deceleration	• Includes one of the following additional features: o Rising baseline rate or fetal tachycardia o Reducing baseline variability o Slow return to baseline FHR after the end of the contraction o Large amplitude (by 60 bpm or to 60 bpm) and/or long duration (more than 60 seconds) • Presence of smooth post deceleration overshoots (temporary smooth increase in FHR above baseline)
	Late deceleration	• Uniform and repetitive decreasing of FHR • Usually slow onset from mid to end of the contraction • Nadir more than 20 seconds after the peak of the contraction • Finishes after the contraction ends • Includes decelerations less than 15 bpm when non-accelerative trace with baseline variability less than 5 bpm
	Prolonged deceleration	• Decrease of FHR below the baseline for longer than 90 seconds and up to 5 minutes
	Bradycardia	• Decrease of FHR below the baseline for longer than 5 minutes

bpm: beats per minute, **CTG:** cardiotocograph**, FHR:** fetal heart rate

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