

Fetal Heart Rate Monitoring

Summary This Guideline reflects evidence-based clinical practice for the accurate interpretation, clinical decision-making and documentation of fetal heart rate (FHR) features to assist in the timely recognition of fetal deterioration. This Guideline aims to reduce the incidence of adverse perinatal outcomes for mothers and babies in NSW.

Document type Guideline

Document number GL2025_004

Publication date 28 April 2025

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Replaces GL2018_025

Review date 28 April 2030

Policy manual Patient Matters Manual for Public Health Organisations

File number CEC 22/315#20

Status Active

Functional group Clinical/Patient Services - Maternity, Nursing and Midwifery
Corporate Administration - Governance

Applies to Local Health Districts, Specialty Network Governed Statutory Health Corporations, Government Medical Officers, Public Hospitals

Distributed to Public Health System, Divisions of General Practice, Government Medical Officers, NSW Ambulance Service, Private Hospitals and Day Procedure Centres, Health Associations Unions, Tertiary Education Institutes

Audience Maternity Clinical Staff

Fetal Heart Rate Monitoring

Guideline Summary

Fetal heart rate (FHR) monitoring is a tool used as part of the comprehensive assessment of fetal wellbeing. It can assist in the timely recognition and response to a fetus at risk of adverse perinatal outcomes due to existing or developing hypoxia. This Guideline provides evidence-based guidance on the appropriate use of FHR monitoring during the antenatal and intrapartum periods.

This Guideline applies to all NSW Health maternity services.

Key Principles

This Guideline reflects best evidence-based clinical practice for the accurate interpretation, clinical decision making and documentation of FHR features that are an indication of fetal wellbeing. FHR monitoring assists in the timely recognition of fetal deterioration and aims to reduce the incidence of adverse perinatal outcomes.

Throughout all pregnancy and birth care planning, women and their families must be fully informed of their options of care. Women and their support person(s) must always be included in care planning and decision making, and consent for healthcare treatment must always be established.

At the earliest opportunity and throughout pregnancy, all women are to be assessed for risk factors and/or complications of pregnancy which may increase the risk of fetal compromise and indicate a need for FHR monitoring.

Care planning and decision making processes are required when fetal and maternal risk factors and/or deterioration are identified or suspected. Clinicians must not make any decision or develop clinical care plans based on the FHR in isolation. A comprehensive assessment must always be conducted as described in this Guideline.

Decision making accountability must reflect local service contexts, be clearly defined and include multidisciplinary consultation involving senior medical input using the Tiered Perinatal Network (TPN) structure as per NSW Health Policy Directive *Tiered Networking Arrangement for Perinatal Care in NSW* [[PD2023_035](#)] and the NSW Health Guideline *Maternity and Neonatal Service Capability* [[GL2022_002](#)].

Consideration of human factors is essential to optimise the recognition of and timely response to fetal and maternal deterioration. The FHR clinical tools (electronic fetal monitoring (EFM) algorithms and EFM tools) are designed to assist clinicians in maintaining situational awareness during FHR monitoring care.

The FHR clinical tools support the recognition and escalation of fetal deterioration in accordance with the [‘Between the Flags’ and the NSW Deteriorating Patient Safety Net System](#), during both the antenatal and intrapartum care periods.

FHR monitoring is recommended for all women during active labour. The mode of monitoring recommended will differ depending on the woman’s individual risk factors, gestation, assessment of fetal movements, stage of labour and preferences.

Where there are any concerns for maternal or fetal wellbeing, these must be escalated in line with local Clinical Emergency Response System (CERS) protocols and the NSW Health Policy Directive *Recognition and management of patients who are deteriorating* ([PD2020_018](#)).

An understanding of fetal physiology and its application to the interpretation of FHR features is essential for the timely detection, escalation and response to fetal deterioration. Clinicians are supported through the NSW Perinatal Safety Education (PSE) program which is mandatory for midwives, obstetricians and trainees.

Each NSW Health maternity service must have established local processes in place to monitor the appropriate use and interpretation of FHR monitoring, the escalation, response and adherence to local CERS processes and compliance with NSW PSE program mandatory requirements.

Revision History

Version	Approved By	Amendment Notes
GL2025_004 April-2025	Secretary	Strengthens the focus on recognition of hypoxia as a cause of fetal deterioration.
GL2018_025 December-2018	Deputy Secretary, Strategy and Resources Division	Revised Guideline replaces GL2016_001 Standardisation of terms to describe FHR features Clarification of the preterm FHR features Revision of antenatal and intrapartum FHR algorithm Introduction of new preterm FHR algorithm and documentation.
GL2016_001 January-2016	Deputy Secretary, Population and Public Health	Correction to gestational age listed on page 7 in table 3 under column 'Antenatal risk factors, requiring intrapartum EFM'.
GL2015_004 March-2015	Deputy Secretary, Population and Public Health	Revised guideline.
PD2010_040 June-2010	Director General	New policy.

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1. Background

Fetal heart rate (FHR) monitoring is a tool used as part of a comprehensive assessment of fetal wellbeing. It can assist in the timely recognition and response to a fetus at risk of adverse perinatal outcomes due to existing or developing hypoxia. FHR monitoring can also detect abnormal FHR features that are not hypoxia related.

All maternity clinicians providing antenatal and intrapartum care are required to have knowledge and understanding of relevant fetal physiology to ensure FHR monitoring is interpreted correctly.

Information on FHR monitoring must be shared with the woman as part of pregnancy/birth care planning. FHR monitoring recommendations and the woman's preferences on these are to be documented in line with the NSW Health Policy Directive *Health Care Records - Documentation and Management* [[PD2012_069](#)].

Care planning and decision making processes are required when fetal and maternal risk factors and/or deterioration are identified or suspected. Decision making accountability must reflect local service contexts, be clearly defined and include multidisciplinary consultation involving senior medical input using the Tiered Perinatal Network (TPN) structure as per NSW Health Policy Directive *Tiered Networking Arrangement for Perinatal Care in NSW* [[PD2023_035](#)] and the NSW Health Guideline *Maternity and Neonatal Service Capability* [[GL2022_002](#)].

Fetal deterioration is a potentially traumatic event and experience for women, families and clinicians. Consideration of the symptoms, responses and behaviours of people in the context of experience can mitigate the impacts of trauma, prevent exacerbation of trauma, and promote healing. An adaptive response includes application of integrated trauma-informed care as described in the NSW Health [Integrated Trauma-Informed Care Framework](#).

1.1. About this document

This Guideline provides evidence-based guidance on the appropriate use of FHR monitoring during the antenatal and intrapartum periods. It applies to all NSW Health maternity services.

FHR monitoring assists in the timely recognition of fetal deterioration and aims to reduce the incidence of adverse perinatal outcomes. Consideration of human factors is essential to optimise the recognition of and timely response to fetal and maternal deterioration.

The FHR clinical tools (electronic fetal monitoring (EFM) algorithms and EFM tools) described in this Guideline provide a standardised method to assist in the recognition of fetal deterioration and support appropriate response and escalation. They are designed to assist clinicians in maintaining situational awareness. These tools are to be used to support accurate interpretation, clinical decision making and documentation of the FHR features that are an indication of fetal wellbeing.

Clinical response and escalation regarding the deteriorating fetus must occur in line with the appropriate EFM tool and the 'Between the Flags' (BTF) calling criteria. Where concerns for maternal or fetal wellbeing are identified these must be escalated in line with local Clinical

Emergency Response System (CERS) and the NSW Health Policy Directive *Recognition and management of patients who are deteriorating* [[PD2020_018](#)].

Throughout this Guideline the terms ‘woman’ and ‘women’ are used. The use of the term woman is not meant to exclude those who give birth and do not identify as female. It is crucial to use the preferred language and terminology as described and guided by each individual person when providing care.

1.2. Key definitions

Altered calling criteria (ACC)	Changes made to the standard calling criteria by the Attending Medical Officer (AMO)/delegated clinician responsible, that considers the unique physiological circumstances and/or medical condition of a woman and fetus. See Section 3.3 .
Annotate	To add notes to a text or diagram giving explanation or comment.
Attending medical officer (AMO)/delegated clinician responsible	Senior medical practitioner who has primary or delegated responsibility and accountability for a woman and fetus on a temporary or permanent basis. For an admitted woman, this is the named Attending Medical Officer (AMO) or another consultant, staff specialist or Visiting Medical Officer (VMO) with delegated responsibility. As defined in local guidelines and following a risk assessment, the delegated clinician responsible may also be another senior clinician.
Cardiotocograph (CTG)	A graphic recording of the fetal heart rate (FHR) features, uterine activity (contractions) and fetal activity as felt by the woman.
Clinical emergency response system (CERS)	A formalised system for staff, patients, carers and families to obtain timely clinical assistance when a woman/fetus deteriorates (physiological and/or mental state). The CERS includes the facility-based and specialty unit-based responses (Clinical Review and Rapid Response). It also encompasses the formalised referral and escalation steps to seek expert clinical assistance and/or request for transfer to other levels of care within the facility (intra-facility) or to another facility (inter-facility).
Electronic fetal monitoring (EFM)	Electronic monitoring used for the evaluation or assessment of fetal wellbeing. The procedure uses a cardiotocograph (CTG) to continuously record the heartbeat of the fetus and the uterine contractions during labour and birth.

Fetal Heart Rate (FHR)	See Appendix 1 for all relevant fetal heart rate (FHR) definitions.
Intermittent auscultation (IA)	Auscultation of the fetal heart rate (FHR) using a handheld Doppler or Pinard stethoscope.
Intrauterine resuscitation	Specific actions implemented with the aim of increasing oxygen delivery to the placenta and umbilical blood flow, to reverse hypoxia and acidosis.
Tiered Perinatal Network (TPN)	A formalised arrangement of maternity and neonatal services within and across local health districts (districts) in NSW and the ACT (Australian Capital Territory) that are linked with a tertiary (Level 6) service to provide support where higher level care is required.

1.3. Relevant NSW Health Policies and Guidelines

This Guideline should be read in conjunction with the following documents:

Table 1. Related NSW Health Policies and Guidelines

NSW Health Policy documents	
Consent Manual	<i>Consent to Medical and Healthcare Treatment Manual</i>
IB2023_028	<i>Hypoxic ischaemic encephalopathy in newborns - recognition, monitoring and early management</i>
GL2021_019	<i>Care Pathway for Women Concerned About Fetal Movements</i>
GL2022_002	<i>Maternity and Neonatal Service Capability</i>
GL2023_004	<i>Care of women with suspected or confirmed Fetal Growth Restriction</i>
PD2012_069	<i>Health Care Records - Documentation and Management</i>
PD2017_044	<i>Interpreters - Standard Procedures for Working with Health Care Interpreters</i>
PD2020_008	<i>Maternity - National Midwifery Guidelines for Consultation and Referral</i>
PD2020_018	<i>Recognition and management of patients who are deteriorating</i>
PD2020_047	<i>Incident Management</i>
PD2023_031	<i>Maternity - Safety and Quality Essentials</i>
PD2023_034	<i>Open Disclosure</i>
PD2023_035	<i>Tiered Networking Arrangements for Perinatal Care in NSW</i>

2. Communication

Effective communication between clinicians, and between women and clinicians has been demonstrated to reduce preventable adverse events in maternity care. Communication in care planning includes multidisciplinary engagement and systems for documentation. These ensure information relevant to the woman's care is available whenever and wherever the woman presents for care.

2.1. Informed decision making

Clear communication between a woman and her healthcare team is essential for safe, high quality care. To enable all women to participate in decision making, information must be communicated in a way that is tailored to individual circumstances (including young women under 18 years of age who fall under the scope of the [Child Safe Standards](#)). This includes considering health literacy, level of understanding and background.

To assist a woman in making informed decisions, all healthcare professionals need to allow adequate time to provide information about care options including the benefits, potential risks, and any alternatives to any care recommendations.

A woman's decisions about her care must reflect her self-determination, autonomy, values and preferences.

Valid consent must be obtained as per the NSW Health Policy and Procedure Manual *Consent to Medical and Healthcare Treatment Manual* ([Consent Manual](#)).

Contemporaneous documentation of conversations and the woman's decisions must be made in the health care record. This includes documentation on care planning if the woman chooses care outside of clinical recommendations.

2.2. Cultural considerations

Acknowledgement and understanding of culturally appropriate and safe care may assist clinicians when providing women and families with information.

When clinicians are caring for Aboriginal women, it is important that they consider the woman's individual needs. Clinicians must ask women and their family if there is anything they need to feel safe and whether discussion with an Aboriginal health care worker would be beneficial to them.

Interpreters must be offered for women from culturally and linguistically diverse backgrounds in compliance with NSW Health Policy Directive *Interpreters – Standard Procedures for Working with Health Care Interpreters* [[PD2017_044](#)].

2.3. Family integrated care

NSW Health staff should offer all women the opportunity to discuss their pregnancy and birth experiences. This includes the opportunity to access a formal debrief with trained clinicians and consideration of integrated trauma-informed care principles.

Inclusion of family members or support person/s in these discussions and the debriefing process must be offered. When caring for Aboriginal women the importance of kinship is to

be acknowledged and discussed with women to ensure careful consideration of their individual needs and their families.

It is important that all women and families are offered wellbeing and psychosocial support, e.g. social work referral, cultural and diversity supports.

When fetal deterioration is recognised and higher-level care needs are identified, unplanned hospital transfer may occur. When this event occurs, taking women away from their local hospital and local support network can be particularly distressing for women and their families. Local processes in the transferring and receiving service must be in place to support and maintain contact between women and their families.

3. Assessment of Fetal Wellbeing

3.1. Principles of fetal heart rate monitoring

Fetal heart rate (FHR) monitoring is a screening tool used to assess fetal wellbeing and assist in recognition of the deteriorating fetus and the possibility of fetal hypoxia. It must be used as part of a comprehensive, clinical assessment of maternal and fetal wellbeing.

Clinicians must not make any decision or develop clinical care plans based on the FHR in isolation. A comprehensive assessment is to include as a minimum:

- the woman's and/or support person's concerns
- the woman's emotional and psychological wellbeing
- presence of antenatal and/or intrapartum maternal and fetal risk factors
- fetal movements
- maternal A-G assessment
- the woman's individual clinical circumstances including progress during labour
- results of relevant tests and screening tools, e.g. symphyseal fundal height measurements, ultrasound, previous cardiotocograph (CTG) traces and fetal blood sampling
- interpretation of the CTG features using the clinical tools (EFM algorithms and EFM tools)
- consideration of the presence of signs of hypoxia e.g. chronic, gradually evolving, subacute and acute ([Appendix 2](#)).

Other clinical circumstances and special considerations that impact FHR monitoring are described in [Section 6](#).

3.2. Clinical tools

The FHR clinical tools (antenatal and intrapartum EFM algorithms and EFM tools) support a physiological approach to interpretation, clinical decision making and escalation of care in

accordance with the [‘Between the Flags’ and the NSW Deteriorating Patient Safety Net System](#).

The clinical tools provide an opportunity to stop and review the full clinical picture at minimum intervals, to assist in maintaining situational awareness. They incorporate a second clinician review to provide a secondary independent review.

3.2.1. Antenatal algorithms and tools

The antenatal monitoring EFM algorithms and EFM tools are to be used prior to labour.

The preterm fetus will have altered FHR features due to immaturity of the cardiovascular and neurological systems, reduced placental reserve, immature adrenal glands, and myocardium, when compared to a term fetus. This evidence informs the EFM algorithms and EFM tools for antenatal assessment < 32 weeks.

Clinicians must therefore ensure the appropriate antenatal EFM algorithms and EFM tools are used according to the woman’s gestation:

- Antenatal < 32 weeks ([EFM algorithm](#) and [EFM tool](#))
- Antenatal ≥ 32 weeks ([EFM algorithm](#) and [EFM tool](#)).

3.2.2. Intrapartum algorithm and tool

The intrapartum EFM algorithm and EFM tool are to be used during active labour:

- Intrapartum ([EFM algorithm](#) and [EFM tool](#)).

In the context of an induction of labour (IOL), the intrapartum EFM algorithm and EFM tool are to be used when oxytocin (Syntocinon®) is commenced.

3.3. Altered calling criteria

Changes may be required to the standard FHR calling criteria where a fetus demonstrates specific FHR features that are in response to clinical circumstances or non-hypoxic causes, e.g. maternal medications, fetal heart block, post-dates pregnancy.

In accordance with the NSW Health Policy Directive *Recognition and management of patients who are deteriorating* [[PD2020_018](#)] a medical officer may alter the standard calling criteria following an assessment in consultation with the Attending Medical Officer (AMO)/delegated clinician responsible.

In the absence of an onsite AMO/delegated clinician responsible, a registered midwife can alter calling criteria as prescribed by the AMO/delegated clinician responsible. This process needs to be outlined in local Clinical Emergency Response System (CERS) protocols.

An assessment must be completed prior to any alterations to calling criteria. This assessment must include a maternal A-G assessment and a comprehensive assessment of fetal wellbeing using the appropriate EFM algorithm and EFM tool.

Any alterations to calling criteria (including cessation of alteration) must be clearly communicated with the woman, the woman’s healthcare team and included in her individualised care plan.

Documentation must include the clinical rationale for any alteration, and care planning must include the minimum timing for review of any alterations to ensure they remain clinically relevant and appropriate.

4. Antenatal Fetal Heart Rate Monitoring

Fetal heart rate monitoring for women admitted to hospital in the antenatal period is to be planned according to individual needs following risk assessment, the full clinical picture, and the woman's preferences.

4.1. Indications for antenatal electronic fetal monitoring

At the earliest opportunity and throughout pregnancy, all women are to be assessed for risk factors and/or complications of pregnancy which may increase the risk of fetal compromise. The decision of who to consult if risk factors are identified must be based on the NSW Health Policy Directive *Maternity - National Midwifery Guidelines for Consultation and Referral* [PD2020_008].

Antenatal factors for which electronic fetal monitoring (EFM) are to be considered are outlined in [Table 2](#). This list is not exhaustive and must not replace clinical judgement, consideration of the full clinical picture, the woman's individual needs or unexpected changes in either the maternal or fetal condition. The use of other fetal wellbeing assessment tools is to be considered, for example, ultrasound scan and Doppler flow studies.

Table 2. Risk factor considerations for antenatal EFM

Antenatal Risk Factors	
- Abdominal trauma or suspected abdominal trauma e.g. following motor vehicle accident, fall or physical assault* - Abnormal Doppler studies - Antepartum haemorrhage - Decreased fetal movements - Detection of fetal bradycardia, fetal tachycardia, or other abnormal findings on auscultation - Diabetes - poorly controlled (diet or medicated) - Known fetal anomaly which requires monitoring - Oligohydramnios or polyhydramnios	- Pre- and post-external cephalic version - Pre- and post-administration of mechanical and chemical cervical ripening agents - Pre- and post-artificial rupture of membranes (ARM) for induction of labour (IOL) - Pregnancy $\geq$ 42 weeks gestation - Preterm uterine activity ($<$ 37 weeks) - Small for gestational age (SGA) or fetal growth restriction (FGR)

**From 25 weeks' gestation, initiate EFM as soon as achievable, monitoring for a minimum of 4 hours from the time that the physical trauma occurred and until all EFM features are normal.*

4.2. Frequency of antenatal electronic fetal monitoring

The frequency of antenatal EFM depends on both the maternal and fetal condition. An individualised collaborative care plan is to be made and documented in the health care record.

In situations where there is a change in the maternal and/or fetal condition and EFM is indicated, EFM is to be performed regardless of the time from the last antenatal EFM assessment.

4.3. Recognition, response and escalation of antenatal fetal deterioration

4.3.1. Interpretation of antenatal electronic fetal monitoring

When first commenced the antenatal EFM is to be observed closely to identify any abnormal features in a timely manner. During antenatal EFM the clinician must annotate on the cardiotocograph (CTG) every 15 minutes as a minimum.

Antenatal EFM must be continued until:

- all features are normal for gestational age
- the maternal and/or fetal condition stabilises.

Initial documentation is to be completed on the appropriate EFM tool when any Red or Yellow Zone features are first identified, or when all features meet the White Zone criteria.

Further documentation is required if antenatal EFM is continued and the EFM tool is to be completed:

- hourly as a minimum
- when any new Red or Yellow Zone features are identified.
- two clinicians are required to independently interpret every feature of the CTG using the appropriate antenatal EFM algorithm and EFM tool, including consideration of the full clinical picture.

Note: if the two clinicians are not in agreement with their assessments, then escalation for a Clinical Review is required as a minimum.

For facilities where an onsite second clinician review may not be possible, local processes are to be developed to support escalation systems that facilitate remote fetal heart rate (FHR) interpretation. This may include utilising virtual care and establishing an agreement with another maternity service within the local health district or through the Tiered Perinatal Network (TPN).

4.3.2. Escalation of suspected fetal deterioration

When there are any concerns regarding fetal wellbeing, clinicians are to immediately escalate these concerns to a senior clinician regardless of duration of FHR monitoring.

Clinicians must escalate any Red or Yellow Zone features, as defined by the appropriate EFM algorithm/EFM tool and in line with local fetal Clinical Emergency Response System (CERS) protocols.

4.3.3. Antenatal intrauterine resuscitation

The management of fetal deterioration commences simultaneously with a CERS call.

A maternal A-G assessment must be performed to include consideration of emergency events (e.g. cord prolapse, placental abruption). Clinicians are to consider the probable cause of any deterioration.

Intrauterine resuscitation must be commenced to reverse fetal hypoxia to avoid or reduce fetal acidosis. Any identified reversible causes of fetal deterioration, such as maternal hypotension or uterine hyperstimulation, must be corrected urgently with appropriate measures.

4.3.4. Antenatal care planning and decision making considerations

When abnormal antenatal fetal heart features are identified, ongoing care planning must include incorporation of the full clinical picture, involvement of the wider multidisciplinary team and the woman's preferences (see [Section 2.1](#)).

Obtaining further input from a maternal fetal medicine (MFM) specialist and neonatologist, utilising the TPN, is to be considered as required.

Where there are antenatal risk factors which are likely to affect fetal reserve in combination with several abnormal fetal heart rate features, these decision-making considerations must not delay the provision of definitive care and urgent birth.

5. Intrapartum Fetal Heart Rate Monitoring

5.1. Mode of monitoring

Fetal heart monitoring (FHR) monitoring is recommended for all women during active labour. The mode of monitoring recommended will differ depending on the woman's individual risk factors, gestation, assessment of fetal movements, stage of labour and preferences.

Clinicians are to take into consideration all these factors when discussing the mode of FHR monitoring with the woman (see [Section 2.1](#)).

At first contact and throughout active labour, all women must be assessed for the presence of risk factors or any new risk factors that indicate recommending a change to FHR monitoring.

There is no evidence to support routine electronic fetal monitoring (EFM) on admission or during active labour in women who do not have any risk factor for fetal compromise.

5.2. Intermittent auscultation

In the absence of any antenatal or intrapartum risk factors intermittent auscultation (IA) is the recommended method of FHR monitoring. This includes during early and established labour, or where there is pre-labour rupture of membranes.

Minimum practice standards when using IA

- Clinicians must use either a Doppler on audible mode or Pinard stethoscope.
- Palpate the maternal radial pulse simultaneously to differentiate between the maternal and fetal heartbeats at the start of every FHR auscultation.
- Document the counted rate (not a range), the rhythm (regular or irregular), and note the presence any abnormal features e.g. decelerations, overshoots.

At first contact in labour

- Perform an abdominal palpation to identify the optimal location for auscultation.
- Assess the strength and frequency of contractions.
- Auscultate in between contractions when there is no fetal activity present to determine the FHR baseline. Listen and count for 60 seconds.
- Auscultate immediately following a contraction. Listen and count for 60 seconds.
- In early labour auscultate during fetal movements. If an acceleration is observed the presence of chronic hypoxia can be excluded.
- Document all findings and determine suitability for IA during labour.
- If a woman is admitted during the latent phase of labour, then an individualised care plan must be made that includes the frequency of maternal and fetal observations.

First and second stages of labour

- Auscultation is to commence immediately following a contraction. Listen and count for 60 seconds:
 - active first stage - every 15 minutes (minimum)
 - passive second stage - every 15 minutes (minimum)
 - active second stage - every 5 minutes (minimum).
- Record the maternal heart rate every hour (minimum) during labour.
- Record the FHR on the labour record graph section every 15 minutes during first and second stages of labour to identify fetal heart baseline rate changes.
- Record the FHR on the labour record every 5 minutes as a minimum during active second stage of labour.
- Record the strength and frequency of contractions every 30 minutes (minimum) during labour.
- Escalation of suspected fetal deterioration
- If an abnormality is suspected or identified during auscultation listen following the next one or two contractions to verify the suspicion or presence of any abnormal features.
- Recommend transition to EFM if abnormal auscultation of FHR is verified or remains suspected.

- If the EFM has all normal features after a minimum of 20 minutes and there are no other risk factors for fetal deterioration, cease EFM and return to IA.

5.3. Intrapartum electronic fetal monitoring

Intrapartum continuous EFM is recommended as a screening assessment to assist in the detection of fetal deterioration when risk factors are present.

Antenatal and intrapartum risk factor considerations for EFM in the intrapartum period are outlined in [Table 3](#). These recommendations are not exhaustive and must not replace clinical judgement or consideration of the full clinical picture or the woman's individual needs and preferences.

Table 3. Risk factor considerations for intrapartum EFM

Antenatal Risk Factors	Intrapartum Risk Factors
• Abnormal antenatal CTG • Abnormal fetal Doppler studies • Abnormalities of maternal serum screening associated with an increased risk of poor perinatal outcomes (e.g. low PAPP-A)* • Antepartum haemorrhage • Breech presentation • Body Mass Index (BMI) ≥ 40 • Decreased fetal movements* • Known fetal anomaly which requires monitoring • Maternal age $\geq 42^*$ • Multiple pregnancy • Pre-existing or current obstetric or other medical condition that may increase risk of fetal compromise (e.g. cholestasis, essential hypertension, isoimmunisation, preeclampsia, illicit substance use) • Pre-existing diabetes, gestational diabetes requiring medication or poorly controlled gestational diabetes • Prolonged pregnancy ≥ 42 weeks • Prolonged rupture of membranes ≥ 24 hours • Oligohydramnios or polyhydramnios • Suspected or confirmed small for gestational age (SGA) or fetal growth restriction (FGR)	• Abnormal auscultation of FHR • Abnormal vaginal bleeding in labour • Suspected chorioamnionitis or sepsis • Maternal hypertension • Maternal pyrexia $\geq 38^{\circ}\text{C}$ • Meconium or blood-stained liquor • Prolonged active first stage of labour • Prolonged second stage of labour where birth not imminent: ○ 1 hour of active pushing: multiparous women ○ 2 hours of active pushing: primiparous women • Preterm labour (< 37 weeks) • Regional anaesthetic (epidural or spinal) or Remifentanyl (including just before insertion for any method used) ** • Use of oxytocin (Syntocinon®) • Uterine tachysystole • Uterine hypertonus • Uterine hyperstimulation • Uterine scar

**If a woman has these indications and appropriate antenatal investigation and assessment has been undertaken with no concerns identified, EFM is not indicated unless other risk factors are present or develop.*

***When EFM has been commenced it must be continued at all times throughout an epidural/spinal insertion procedure.*

5.3.1. Recognition, response and escalation to intrapartum fetal deterioration

Key clinical care considerations

- Abdominal palpation is to be performed to identify the optimal location to monitor the fetal heart.
- Maternal pulse is to be counted and documented hourly as a minimum to ensure differentiation from the FHR.
- At first contact in labour it is important to assess the FHR features to exclude chronic hypoxia. This can be determined by the presence of accelerations of the FHR that reflect an intact autonomic nervous system.
- All events that may affect the FHR features (e.g. vaginal examinations, medications, change of position, FBS, or epidural insertion) are to be annotated on the CTG trace at the date/time that they occur.
- All CTGs must be reviewed and the CTG trace annotated every 15 minutes as a minimum.
- The FHR baseline must be recorded on the labour record graph every 15 minutes to identify any changes.
- A full interpretation of the CTG using the intrapartum EFM algorithm must be recorded in the health care record using the appropriate EFM tool, at a minimum of every hour or when any new Yellow or Red Zone features are identified.
- A second clinician must provide an independent review of the CTG each hour, and cocomplete the appropriate EFM tool, noting the date and time of their assessment and whether they agree with the first clinician's assessment.
- If the two clinicians are not in agreement with their assessments, then escalation for a Clinical Review is required as a minimum.
- Clinicians must escalate any abnormal FHR parameters, as defined by the appropriate EFM algorithm/EFM tool and in line with local fetal Clinical Emergency Response System (CERS) protocols.

Note: a clinician may call for a Clinical Review at any time there is concern. Where a clinician has serious concern, they may escalate via a Rapid Response.

5.3.2. Intrapartum intrauterine resuscitation

The management of fetal deterioration commences simultaneously to a fetal CERS call.

The principle of management is to optimise fetal condition whilst an ongoing collaborative care plan is formulated.

When abnormal FHR changes are identified clinicians must consider the likelihood of fetal hypoxia.

A prompt response to signs of deterioration in the fetus is required. This response needs to consider early communication using the Tiered Perinatal Network (TPN) structure where higher-level care needs are identified as per NSW Health Policy Directive *Tiered Networking Arrangement for Perinatal Care in NSW* [[PD2023_035](#)] and the NSW Health Guideline *Maternity and Neonatal Service Capability* [[GL2022_002](#)].

Intrauterine resuscitation must be commenced to reverse fetal hypoxia where possible, aiming to increase placental perfusion and fetal oxygen delivery, to prevent fetal acidosis.

As intrauterine resuscitation is commenced, a maternal A-G assessment must be performed to incorporate the full clinical picture including consideration of emergency events (e.g. cord prolapse, placental abruption, uterine rupture).

Intrauterine resuscitation care considerations include but are not limited to:

- change of maternal position (e.g. left lateral recumbent)
- rapid intravenous fluids
- cessation of oxytocin infusion (Syntocinon®)
- inhibition of uterine contractions via tocolytic administration
- specific manoeuvres for emergencies (e.g. umbilical cord prolapse).

Birth is to be expedited where there is evidence of fetal decompensation with ongoing features of fetal hypoxia. This evidence may be based on FHR features or other clinical concerns, such as suspected placental abruption or maternal/fetal sepsis.

5.4. Other fetal monitoring considerations

5.4.1. Fetal scalp electrode

When the quality of the tracing prevents accurate assessment of the FHR features then monitoring the FHR with a fetal scalp electrode (FSE) is recommended.

Abnormal FHR features alone are not an indication for application of a FSE when the external transducer is providing an adequate tracing.

Recording of the maternal pulse may occur inadvertently when using FSE. Therefore, after a FSE is applied, the maternal pulse must be palpated hourly to ensure differentiation from the FHR.

Clinicians must be aware that it is possible to achieve a tracing via FSE that is of maternal origin in the presence of fetal death in-utero. Clinicians must differentiate the maternal and fetal heart rates and consider the use of ultrasound where there is any suspicion of fetal demise.

Contraindications

Contraindications to FSE application include:

- monitoring during water immersion
- where acute or subacute fetal hypoxia is suspected and applying FSE may delay expediting birth
- preterm gestation < 34 weeks
- blood born infection (e.g. HIV (Human Immunodeficiency Virus), Hepatitis B or C)
- active genital herpes simplex
- suspected maternal or fetal infection/sepsis
- known or suspected fetal bleeding disorders (e.g. Haemophilia or maternal thrombocytopenia)
- malpresentation (e.g. face presentation).

5.4.2. Wireless telemetry

Women benefit from ambulation during active labour. Encouraging women to move around and adopt positions of choice is to be supported and wireless telemetry made available.

Where water immersion is available for labour, waterproof wireless transducers are to be available to support the woman's choice.

5.5. Adjunctive tests to assess fetal wellbeing

5.5.1. Fetal scalp stimulation

In the presence of an abnormal CTG, fetal scalp stimulation may be considered. Following fetal scalp stimulation where there is both an acceleration of the FHR and sustained improvement in the CTG then the presence of fetal hypoxia is unlikely. The clinician must also consider the full clinical picture.

The absence of an acceleration of the fetal heart rate following fetal scalp stimulation may indicate the presence of fetal hypoxia and requires further escalation, including consideration of expediting birth.

5.5.2. Fetal blood sampling

There is recent but limited evidence that the use of fetal blood sampling (FBS) improves outcomes for women and babies compared with CTG alone or compared with CTG in combination with fetal scalp stimulation.

The decision to perform FBS and subsequent care planning must involve consultation with a senior medical officer.

FBS may be considered as an adjunctive test to assess fetal condition in support of EFM interpretation, and the detection and management of fetal hypoxia.

Where there is concern regarding fetal hypoxia, FBS may assist with ongoing intrapartum care planning. Lactate or pH measurement are appropriate options.

Ongoing care planning must include planned timing for repeating the FBS as appropriate.

Contraindications

Contraindications to FBS include:

- where acute or subacute fetal hypoxia is suspected and performing FBS may delay expediting birth
- preterm gestation < 34 weeks
- blood born infection (e.g. HIV (Human Immunodeficiency Virus), Hepatitis B or C)
- active genital herpes simplex
- suspected maternal or fetal infection/sepsis
- known or suspected fetal bleeding disorders (e.g. Haemophilia or maternal thrombocytopenia)
- malpresentation (e.g. face presentation).

When interpreting the results clinicians are to incorporate the full clinical picture of the woman and fetus, including the rate of progress in labour. Clinicians must also consider previous pH/lactate results to identify any trends. Values to support FBS interpretation are described in [Table 4](#).

Table 4. FBS interpretation

pH		Lactate	
Result	Interpretation	Result	Interpretation
≥ 7.25 mmol/L	Normal	≤ 4.2 mmol/L	Normal
7.21 - 7.24 mmol/L	Borderline	4.2 - 4.8 mmol/L	Borderline
≤ 7.20 mmol/L	Abnormal: birth is indicated	≥ 4.9 mmol/L	Abnormal: birth is indicated

5.5.3. Paired cord blood gas sampling

Paired cord blood gas samples are to be taken at birth where there has been concern regarding fetal condition in labour and/or at birth. Cord blood gas samples at birth enable the detection of respiratory, mixed or metabolic acidosis. This supports neonatal care planning through identification of babies who may require higher level care.

Collection of both arterial and venous paired cord blood samples is recommended. Careful consideration is to be made to ensure the sampling and interpretation of cord blood gases is accurate, particularly where single samples are analysed.

6. Special Considerations

6.1. Interruptions to fetal heart rate monitoring

6.1.1. Electronic fetal monitoring signal loss

Where the fetal heart rate (FHR) cannot be heard and/or distinguished from the maternal pulse within a 3-minute period, prompt escalation is required in accordance with the local fetal Clinical Emergency Response System (CERS) protocol to facilitate urgent assistance.

Immediate steps are to be taken to establish contact, for example, change maternal position, alter the position of the transducer.

If contact cannot be established with the external transducer, then consideration of fetal scalp electrode (FSE) application and/or escalation for assistance with locating the fetal heart rate via ultrasound is to occur.

6.1.2. Transfer to the operating theatre

Disruptions to fetal monitoring must be minimised during transfer to the operating theatre and prior to birth of the fetus, particularly when there are abnormal FHR features.

The FHR must be monitored by intermittent auscultation (IA) during unavoidable interruptions, with re-commencement of continuous electronic fetal monitoring (EFM) as soon as possible and immediately on arrival in the operating theatre environment.

FHR monitoring is to be continued in the operating theatre environment to identify any further deterioration in fetal condition that could require escalation and a need to expedite birth.

Any concerns of fetal deterioration must be escalated to the most senior obstetric medical officer.

All concerns for fetal welfare are to be communicated to all members of the operating theatre care team, including theatre and anaesthetic teams, using closed loop communication.

6.2. Electronic fetal monitoring less than 25 weeks gestation

There is a lack of evidence for the use of EFM for the extremely preterm fetus less than 25 weeks gestation. Accurate interpretation of FHR features in early gestations is problematic due to the immaturity of the various physiological processes which regulate the fetal heart.

The use of EFM and interpretation of FHR features at less than 25 weeks gestation must be in consultation with a specialist obstetrician or maternal fetal medicine (MFM) specialist and neonatologist, utilising the Tiered Perinatal Network (TPN) as required.

6.3. Multiple pregnancies

Multiple pregnancies are associated with a higher incidence of morbidity and mortality than singleton pregnancies.

To ensure the accurate recording and interpretation of the distinct FHR features in a twin pregnancy when continuous EFM is required, clinicians are to:

- monitor each fetus simultaneously using the same machine
- consider using the functions of the cardiotocograph (CTG) machine to 'separate' each FHR pattern on the trace (offset function) to ensure that each fetus is monitored separately, and features can be accurately interpreted
- ensure each fetus has a distinct pattern especially when the CTG is set to 'offset function'. Fetuses can have similar FHR, however, they will not have the same pattern
- document FHR for each fetus on two separate EFM tools to differentiate between each fetus
- ensure that a distinct and interpretable EFM is obtained for each fetus before monitoring is ceased in the antenatal period
- escalate any concerns regarding fetal wellbeing or FHR in line with the local fetal CERS protocol.

Collaborative care plans for fetal wellbeing assessment in higher order multiple pregnancies (i.e. triplets) must always be developed in consultation with the woman and a MFM specialist through the TPN, regardless of whether EFM is indicated or required.

6.4. Non-hypoxic causes of abnormal fetal heart rate features

Fetal heart rate features can be abnormal due to non-hypoxic causes. These causes include, but are not limited to, congenital fetal anomalies, fetal arrhythmias, maternal medications (e.g. opioids, magnesium sulphate, anaesthesia) and maternal conditions such as metabolic disorders and infection.

In the presence of an abnormal FHR trace where a non-hypoxic cause is suspected or confirmed, a multidisciplinary team review must be conducted, and an ongoing collaborative care plan developed and documented.

When maternal sepsis is suspected or confirmed, clinicians must follow the [Maternal Sepsis Pathway](#).

The multidisciplinary team review must include the neonatal team, especially if there are underlying fetal neurological or cardiac anomalies. An individualised neonatal care plan must be developed and documented to optimise the neonatal outcome post birth. This plan may also include ensuring ongoing care is planned in a facility with appropriate service capability.

6.5. Birth planning with the neonatal care team

Where maternity services have determined the need for imminent birth of a baby where fetal hypoxia is suspected or identified or other fetal heart rate concerns have been identified, communication with the neonatal care team is required.

Always ensure that the appropriate clinical handover has occurred, including but not limited to:

- planned mode of birth

- gestational age
- condition of the fetus
- antenatal corticosteroids and Magnesium Sulphate (MgSO₄) administration, where appropriate, including the gestational age of administration • any maternal and pregnancy risk factors
- fetal investigations (where available).

Optimal care planning includes the availability of multidisciplinary team members to support stabilisation and potential admission to a neonatal unit. Where birth occurs without appropriate neonatal services, early communication with the NSW Newborn and paediatric Emergency Transport Service (NETS) to initiate escalation via the TPN is required.

7. Embedding Safety

7.1. Education

An understanding of fetal physiology and its application to the interpretation of fetal heart rate (FHR) features is essential for the timely detection of fetal deterioration. Clinicians are provided educational support via the NSW Perinatal Safety Education (PSE) program.

All clinicians responsible for FHR monitoring must be up to date with the NSW PSE program as outlined in the [NSW Deteriorating Patient Education Strategy](#). PSE is mandatory education for all NSW Health midwives, obstetricians and trainees. Local health districts are responsible for monitoring compliance with the mandatory PSE training requirements.

Districts are to have processes that ensure that all maternity clinicians, particularly locum and agency staff employed in obstetrics/midwifery, have the required skills and education to assess fetal welfare confidently and competently prior to undertaking clinical care.

7.2. Governance

Each NSW Health maternity service must have local processes in place to monitor the:

- appropriate use and interpretation of FHR monitoring to detect fetal deterioration
- escalation and response when there are concerns about fetal wellbeing in line with the NSW Health Policy Directive *Recognition and management of patients who are deteriorating* [[PD2020_018](#)], including:
 - escalation of fetal deterioration using local CERS processes, and
 - adherence to local CERS processes.

Local processes must support clinicians to learn from harm or near misses in the NSW Health Policy Directive *Incident Management* [[PD2020_047](#)]. These learnings are to support the identification of opportunities to enhance fetal safety and drive continuous improvement.

NSW Maternity services are encouraged to access current data available via the Clinical Excellence Commission [QIDS \(Quality Improvement Data System\) MatIQ](#) maternity intelligence system. Near-real-time data is essential to identify and monitor current and

emerging clinical risks, as well as support and promote a culture of continuous quality improvement.

Clinical reviews and audits must be in line with the minimum safety and quality indicators as recommended in the NSW Health Policy Directive *Maternity - Safety and Quality Essentials* [[PD2023_031](#)].

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9. Appendices

1. Definitions used with fetal heart rate monitoring
2. Types and features of intrapartum hypoxia

9.1. Definitions used with fetal heart rate monitoring

Feature	Descriptor	Definition
Note: definitions vary for < 32 weeks in the antenatal period (see appropriate EFM algorithm)		
Uterine activity	Tachysystole	The presence of more than 5 contractions in 10 minutes without fetal heart rate (FHR) abnormalities.
	Uterine hypertonus	Contractions lasting more than 2 minutes in duration or contractions occurring within 60 seconds of each other, without FHR abnormalities.
	Uterine hyperstimulation	Tachysystole or uterine hypertonus in the presence of FHR abnormalities.
Baseline rate	Baseline FHR	Recorded as a single rate, this is the mean level of the FHR when it is stable, excluding accelerations, decelerations, and contractions. It is determined over a period of 5 to 10 minutes. Preterm fetuses tend to have values towards the upper end of this range.
	Normal baseline	110 - 160 bpm
	Baseline tachycardia	> 160 bpm
	Baseline bradycardia	< 110 bpm
	Rise in baseline rate	A gradual rise over time, an ongoing increase in the fetal heart baseline rate. In this Guideline, a 10% rise from baseline is considered significant.
Variability	Baseline variability	The minor fluctuations in baseline FHR. Assessed by estimating the difference in beats per minute (bpm) between the highest peak and lowest trough of fluctuation in one minute of the trace between contractions. Normal is 6-25 bpm.
	Normal variability	6 - 25 bpm
	Increased baseline variability (saltatory pattern)	> 25 bpm
	Reduced variability	< 6 bpm
	Absent variability	< 3 bpm
	Cycling	Cycling refers to the alternating periods of fetal active sleep, fetal quiet sleep and fetal active awake. Evidence of 'cycling' between states provides assurance of neurological integrity and the absence of significant acidaemia or acidosis. The absence of cycling may occur in hypoxia and fetal infections including encephalitis and intrauterine fetal stroke.

	Sinusoidal	A regular oscillation of the baseline long-term variability resembling a sine wave. This smooth, undulating feature, lasting at least 30 minutes, has a relatively fixed period of 2-5 cycles per minute and an amplitude of 5-15 bpm above and below the baseline. Baseline variability is absent and there are no accelerations.
	Sawtooth	A feature resembling the sinusoidal features, but with a more jagged 'saw-tooth' appearance, rather than a sine-form wave. Its duration seldom lasts more 30 minutes and is characterised by normal features, before and after. The pseudosinusoidal features have been described after analgesia administration to the woman, and during periods of fetal sucking and other mouth movements. It is sometimes difficult to distinguish the pseudosinusoidal features from the true sinusoidal features, leaving the short duration of the pseudosinusoidal features as the most important variable to discriminate between the two.
Accelerations	Reactivity	A component of antenatal FHR features that is present when there are a minimum of 2 accelerations in any given 20 minute period.
	Acceleration	A transient increase in FHR of 15 bpm or more above the baseline and lasting more than 15 seconds from rise from the baseline to return to the baseline. The significance of no accelerations in an otherwise normal intrapartum trace is unclear. Accelerations in the preterm fetus may be of a lesser amplitude and shorter duration.
Decelerations		Transient episodes of decrease of FHR below the baseline of more than 15 bpm lasting at least 15 seconds occurring in the antenatal or intrapartum period. In a trace showing no accelerations and reduced variability, the definition of decelerations also includes those with an amplitude of 10-15 bpm (shallow decelerations).
Antenatal Decelerations	Single isolated	No more than one per hour.
	Recurrent	Occurring more than one per hour.

(may be seen in an antenatal trace in the presence of uterine activity e.g. Braxton Hicks, or without uterine activity)	Prolonged	Lasting more than 3 minutes.
Intrapartum Decelerations	Early	Uniform, repetitive, periodic slowing of the FHR with slow onset early in the contraction and slow return to baseline by the end of the contraction.
	Variable	Decelerations with rapid onset and recovery which may be occasional or repetitive. Time relationships with the contraction cycle may be variable but most commonly occur simultaneously with contractions.
	Complicated variable	Variable decelerations (as above) that occur with any of the following additional features: • rising baseline or fetal tachycardia • reducing baseline variability • slow return to baseline FHR after the end of the contraction • large amplitude (fall to 60 bpm or by 60 bpm) and/or long duration (60 seconds) • presence of smooth post deceleration overshoots (temporary increase in FHR above baseline).
	Late	Uniform, repetitive, decreasing of the FHR with slow onset mid to end of the contractions and nadir (deepest point) more than 20 seconds after the peak of the contraction and ending after the contraction. In the presence of a non-accelerative trace with baseline variability less than 5 bpm, the definition of late decelerations would include those less than 15 bpm.
	Prolonged	Deceleration for longer than 90 seconds.
	Repetitive	More than 50% of contractions.

9.2. Types and features of intrapartum hypoxia

Hypoxia	Features
No hypoxia	- Baseline appropriate for gestational age - Normal variability and cycling - No repetitive decelerations
Chronic hypoxia <i>Note: this is an antenatal hypoxia with implications for intrapartum care</i>	- Higher baseline than expected for gestational age - Reduced variability and/or absence of cycling - Absence of accelerations - Shallow decelerations - Consider the presence of fetal indicators: decreased fetal movements, meconium, bleeding, evidence of chorioamnionitis, fetal growth restriction (FGR)
Gradually evolving hypoxia	Compensating
	Rise in the baseline (with normal variability and stable baseline) preceded by decelerations and loss of accelerations
	Decompensating
	- Reduced or increased variability - Unstable/progressive decline in the baseline (step ladder pattern to death)
Subacute hypoxia	- More time spent in decelerations than at the baseline - May be associated with saltatory pattern (increased variability)
Acute hypoxia	Prolonged deceleration > 3 minutes

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