Fetal Monitoring guideline

Classification:	Guideline
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Departments/Group this Document applies to:	Maternity

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Guideline to be followed by (target staff): Maternity Staff

To be read in conjunction with the following documents:
Induction of labour
Labour and birth
Reduced Fetal Movements
Obesity in pregnancy
Vaginal birth after caesarean section and care of women with previous uterine surgery
Maternity Early Observation Warning System including Level 1 Pathway Escalation
Maternal Sepsis
BSOTS Maternity Triage

Are there any eCARE implications? Yes

CQC Fundamental standards:
Regulation 9 – person centered care
Regulation 10 – dignity and respect
Regulation 11 – Need for consent
Regulation 12 – Safe care and treatment
Regulation 13 – Safeguarding service users from abuse and improper treatment
Regulation 14 – Meeting nutritional and hydration needs
Regulation 15 – Premises and equipment
Regulation 16 – Receiving and acting on complaints
Regulation 17 – Good governance
Regulation 18 – Staffing
Regulation 19 – Fit and proper

Disclaimer -

Since every patient's history is different, and even the most exhaustive sources of information cannot cover every possible eventuality, you should be aware that all information is provided in this document on the basis that the healthcare professionals responsible for patient care will retain full and sole responsibility for decisions relating to patient care; the document is intended to supplement, not substitute for, the expertise and judgment of physicians, pharmacists or other healthcare professionals and should not be taken as an indication of suitability of a particular treatment for a particular individual.
The ultimate responsibility for the use of the guideline, dosage of drugs and correct following of instructions as well as the interpretation of the published material **lies solely with you** as the medical practitioner.

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Guideline Statement

The fetal monitoring guideline provides guidance to clinicians to support the documentation, interpretation, and management of fetal monitoring.
It is to be used in conjunction with the associated guidelines related to fetal heart rate monitoring of pregnant and labouring Women/Birthing people.

All Women/Birthing people/birthing people should have the opportunity to discuss fetal monitoring options at the antenatal birth planning appointment, following this, on admission, an individual risk assessment should be completed to determine the recommended method for fetal monitoring. This risk assessment and recommendation will then be discussed with the woman/birthing person and an opportunity provided to answer any questions which they may have to support them with informed decision making. Once the woman/ birthing person has made a choice as to the method of fetal monitoring they wish to accept, this will be respected by the care providers.
All discussions and decisions should be documented in the maternity records to enable the detail surrounding the information provided and the decision reached to be clear.

Executive Summary

Fetal heart monitoring is a screening tool to support the identification of babies who are demonstrating evidence of hypoxia, consequently reducing the risk of hypoxic-ischemic encephalopathy (HIE), one of the main causes of fetal death and brain injury in the newborn.

Definitions

ADAU – Antenatal day assessment unit ARM – Artificial rupture of membranes AH – Acute Hypoxia AN – Antenatal BPM – Beats per minute CH – Chronic Hypoxia CNS – Central nervous system CTG – Cardiotocograph cCTG – Computerised CTG analysis CS – Caesarean section eCare – Electronic patient record EDM – Electronic data management system EFM – Electronic fetal monitoring FBS – Fetal blood sampling FM – Fetal movements FH – Fetal heart rate FSE – Fetal scalp electrode FSS – Fetal scalp stimulation	G.A. – Gestational age GEHC – Gradually Evolving Hypoxia -Compensated GEHD - Gradually Evolving Hypoxia Decompensated IA – Intermittent auscultation IOL – Induction of labour IUD – Intra-uterine death IUGR – Intra-uterine growth restriction LW – Labour ward MEOWS – Maternity early observation warning system MKUH - Milton Keynes University Hospital MPDT – Maternity Practice Development Team MW – Midwife NEH – No evidence of hypoxia PET – Pre-eclampsia PP – Presenting part SAH – Sub-Acute Hypoxia STV – Short term variability TNA – Training Needs Analysis VE – Vaginal examination

1.0 Roles and Responsibilities:

This guideline applies to all staff providing care for pregnant Women/Birthing people: Midwives/Obstetricians –

- Complete annual (minimum) multi-professional fetal monitoring training and associated assessments as per maternity training needs analysis (TNA)
- Identify personal learning needs and seek training and support if required
- Ensure competent to use all equipment related to fetal monitoring (Central monitoring, CTG machines (including application of FSE), Handheld doppler, Pinard
- Maintain equipment – Ensure it is clean and in working order, report faulty equipment

Support staff -

- Maintain equipment – Ensure it is clean and in working order, report faulty equipment.

2.0 Implementation and dissemination of document

- Dissemination via the guideline and governance process for the Trust.
- Available via Trust intranet
- Additional dissemination via email and fetal monitoring study day, maternity senior team newsletter, fetal monitoring newsletter and fetal monitoring notice board

3.0 Processes and procedures

- Women/Birthing people should be risk assessed on admission, to establish the most appropriate method of fetal monitoring, document on e-Care including record of discussion with the woman
- Additional review of risks should be performed every hour in labour with FRESH EYES/FRESH CARE assessments, or sooner if there is a change in risk identified
- Abdominal palpation should be offered to determine the lie, presentation, and position of the baby prior to auscultation of the FH
- The FH should be located by use of Pinard or Handheld doppler prior to using commencing continuous EFM
- Maternal pulse should be palpated simultaneously when auscultating FH.
  It should be routinely documented to differentiate between maternal pulse and the FH. It should be performed at routinely with antenatal auscultation (if auscultating at AN appointments), at the initial admission assessment, at the start of the CTG or IA and hourly throughout labour care.

3.0.1. Methods/equipment

- Pinard stethoscope
- Handheld doppler (Sonicaid)
- Cardiotocograph (CTG) machine
- Wireless telemetry CTG machine
- CTG Central Monitoring system (Centrale 3)

3.0.2 Documentation

- Woman's details, CTG checks, indication for CTG and number of trace must be documented at the start of the CTG - use CTG commencement sticker (Appendix 2: CTG Start/End stickers)
- At the end of the CTG trace, document details of birth, if baby not birthed: use sticker to indicate CTG has been discontinued and the plan of care - CTG discontinued sticker (see Appendix 2: CTG Start/End stickers)
- Intrapartum FRESH EYES stickers must be completed and stuck to the CTG at the relevant time
- All assessments and observations regarding CTG trace should be documented in the maternal eCare records (work flow – assessment fluid balance for all FH and FRESH EYES, clinical note //matfc for FRESH CARE, further clinical notes may be required to document further details)

3.0.3 Storage

- CTG traces must be:
  - numbered in date order
  - stored in dedicated CTG envelope (filed in handheld notes)
  - sent to medical records for scanning onto EDM
  - stored for 25 years

3.1 Antenatal fetal heart rate monitoring

3.1.1 Antenatal intermittent ausciltation

When auscultation is performed:

- Auscultate for a full minute
- Differentiate from maternal pulse
- Document as a single figure

- Women/Birthing people should be advised that routine antenatal auscultation of the fetal heart provides a snapshot of fetal heart rate, fetal well-being is better indicated by fetal movement and serial fundal height measurements from 26-28 weeks (or serial growth scans for Women/Birthing people with identified risk factors).
- FH must be auscultated pre/post an intervention e.g. VE, and prior to the administration of intramuscular analgesia
- Women/Birthing people should be discouraged from using any home kits to auscultate the fetal heartbeat (Tommy's, 2019; Royal College of Midwives, 2017)
- Auscultation of the FH at routine antenatal appointments can be undertaken as part of the whole clinical assessment and reviewed at subsequent unplanned admissions – document as a single figure counted for 1 minute, differentiate from maternal pulse

3.1.2 Initial FH assessment on any AN admission/assessment of labour

- Offer auscultation of the FH at first contact with a woman in suspected or established labour, and at each further assessment (NICE 2017)
- If EFM not indicated, auscultate the FH rate on admission for at least one-minute in-between contractions, thereafter the fetal heart should be auscultated immediately after contractions.
  - Palpate maternal pulse simultaneously differentiate FH from maternal pulse

3.1.3 Antenatal indications for use of EFM – Fetal monitoring plan will depend on the reason for admission and clinical assessment

This list is not exhaustive, if in doubt, discuss with Senior Midwife, Obstetric Registrar, Consultant Obstetrician, Consultant Midwife, Fetal surveillance leads.

Maternal risks	Fetal risks
• Low PAPP-A (even with normal growth scans) • Hypertension • Diabetes • Cardiac disease • Obstetric Cholestasis • Hyperthyroidism • Vascular disease • Renal disease • Antepartum haemorrhage • Previous caesarean section / uterine surgery • Prolonged rupture of membranes >24hrs • Induction of labour	• Fetal Growth Restriction/SGA • Prematurity • Meconium-stained liquor • Multiple pregnancy • Breech presentation • Oligohydramnios/Polyhydramnios • Isoimmunisation

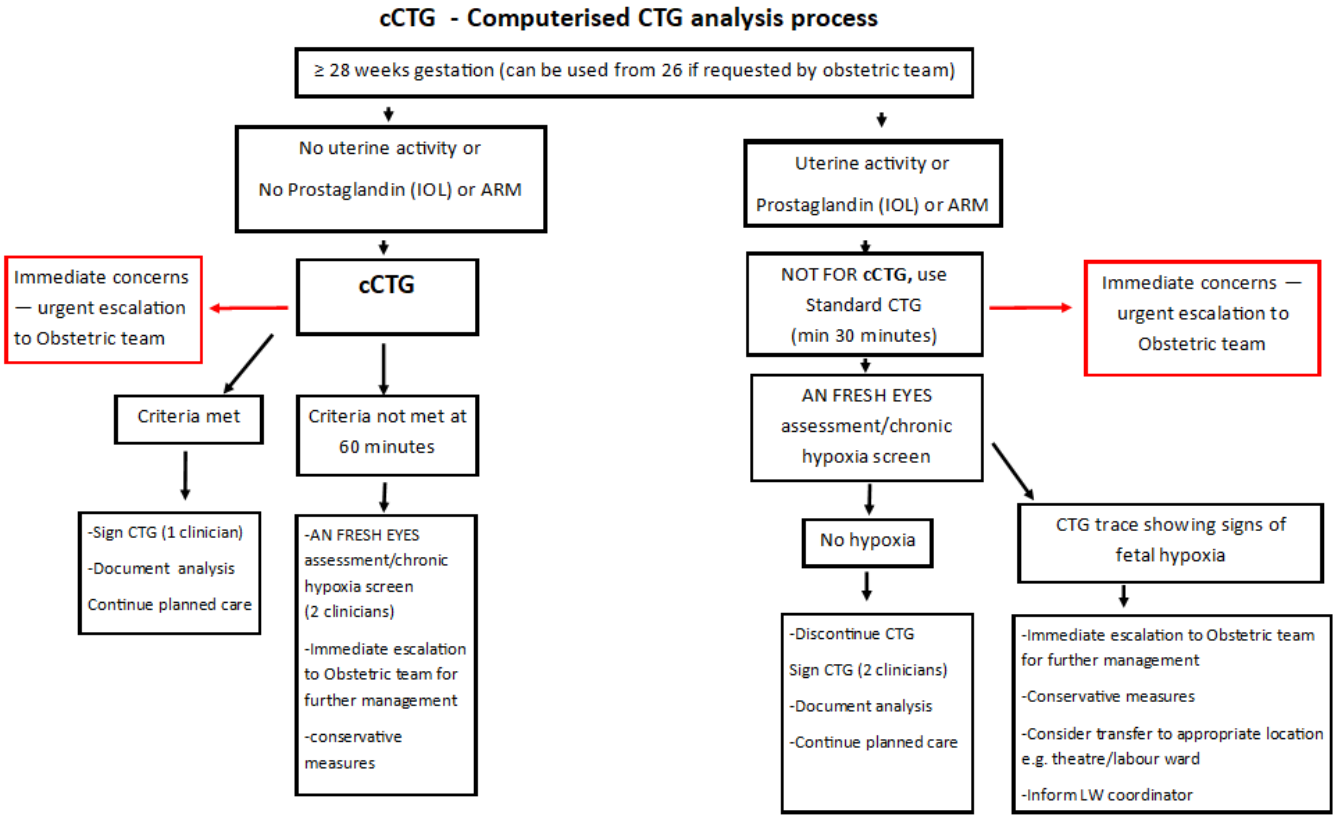
3.1.4 Computerised CTG analysis (cCTG):

The use of the cCTG is not a replacement of clinical judgement. If other associated signs or symptoms are present, further maternal, and fetal assessment is required, even if cCTG criteria are met. In these circumstances the on-call obstetric registrar should be informed and attend to review

cCTG analysis initially takes place after 10 minutes of EFM and every 2 minutes thereafter. When the cCTG criteria are met, it will indicate on the CTG monitor (either a tick will appear on the CTG display or the analysis box will go green). One clinician (Midwife or Obstetrician) can review and document and sign for CTG when cCTG are criteria met.

When using cCTG to assess fetal wellbeing STV **must not** be used for analysis **before** 60 minutes.

CTG abnormal before 60 minutes – Do not wait for cCTG analysis; Escalate immediately. Action should be based on fetal/maternal clinical assessment – do not wait for STV at 60 minutes before action taken.



cCTG criteria <u>not met</u> at 60 minutes:
Immediate escalation to Obstetric Registrar/Consultant required.
Print analysis and continue CTG recording – Dependant of the machine used, analysis and STV value will print out with additional details of why criteria not met or will it include codes (when using Dawes Redman analysis on a Huntleigh machine) to indicate the reason analysis not met.
It is essential to review the CTG in the context of the clinical picture and not focus solely on the analysis or STV.
Please note: Variability assessed using FRESH EYES analysis is different from STV assessed as part of DR analysis. STV normal range is ≥4 milliseconds with no upper limit.

Codes printed when criteria not met
1. Basal heart rate outside of normal range 2. Large decelerations 3. No episodes of high variation 4. No movements and fewer than 3 accelerations 5. Baseline fitting is uncertain 6. Short-term variation is less than 3ms 7. Possible error at the end of record 8. Deceleration at the end of record 9. High-frequency sinusoidal rhythm 10. Suspected sinusoidal rhythm 11. Long-term variation in high episodes below acceptable level 12. No accelerations

STV analysis – assessed at **60 minutes** when cCTG analysis criteria **not** met	
STV	**Suggested action**
≥ 4.0 milliseconds	≥37 weeks – repeat CTG within 6 hours <37 weeks – repeat CTG within 12 hours unless, reduced fetal movements or other fetal risk factors identified, then repeat within 6 hours
3.0-3.99 milliseconds	Repeat CTG within 6 hours
< 3.0 milliseconds	Pre-terminal trace – immediate action required (escalate to Obstetric registrar)

3.1.5 Antenatal Fresh Eyes analysis

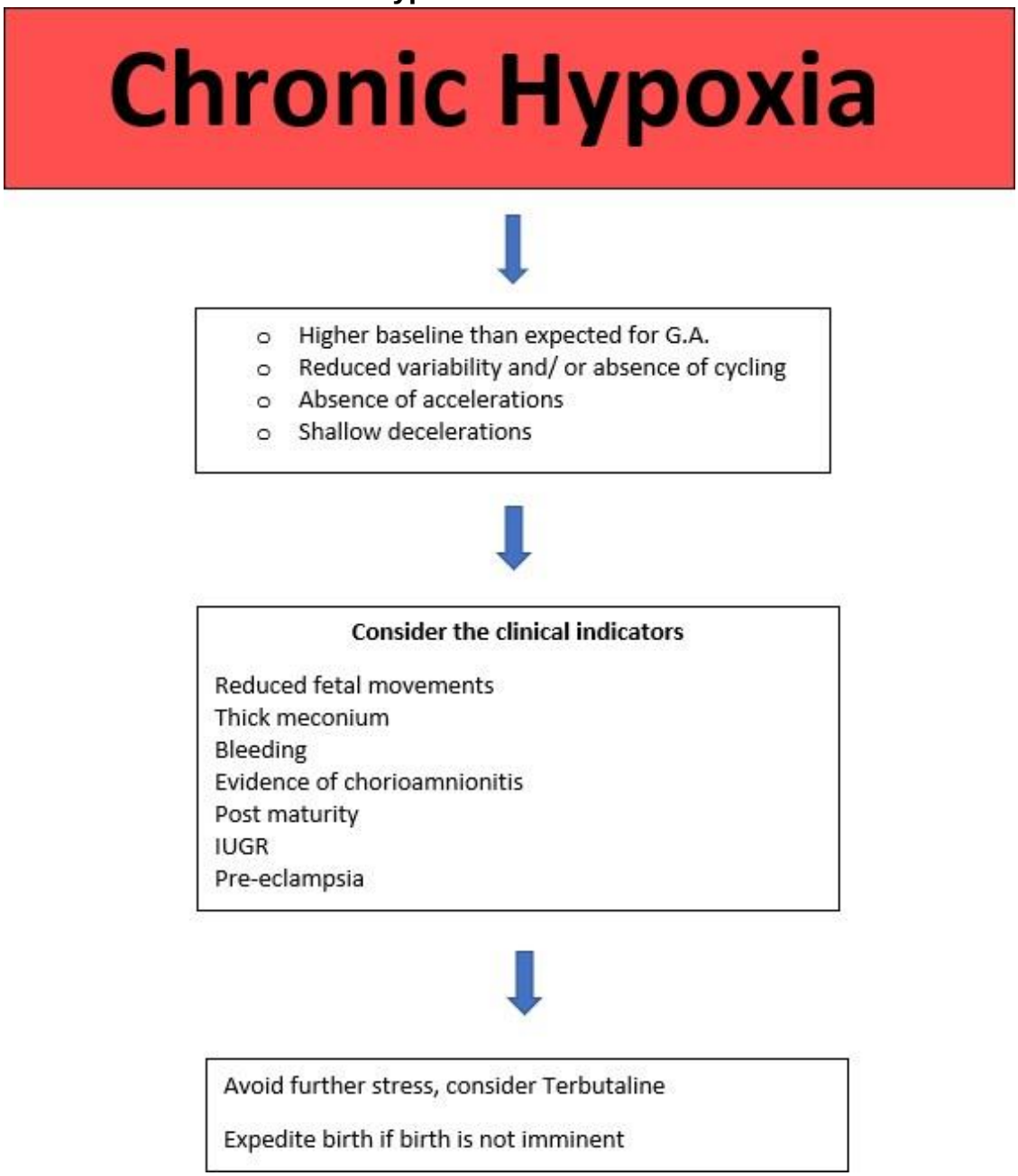
Antenatal fetal wellbeing CTG should be undertaken for a minimum of 30 minutes
Immediate escalation to obstetric team for review if any feature is abnormal (red box circled) for further management plan.

Antenatal FRESH EYES tool									
Risks identified:						Maternal pulse: _____bpm		Gestation: ___/40	
Baseline appropriate for gestation	Y	N	Normal fetal movements in last 24hrs	Y	N	Decelerations present	Y	N	If yes – circle Shallow Baroreceptor Chemoreceptor
Baseline stable	Y	N	Cycling present	Y	N	DR criteria met	Y	N	If N STV at 60min: ___
Baseline rate 110-160bpm	Y	N	Variability 5-25bpm	Y	N	Uterine activity: Reg/Irregular/Strong/Mod/Mild ___:10 mins Lasting: ___secs Inter-contraction rest: ≥90 secs Y/N			
Baseline rise ≥10%	Y	N	Accelerations present	Y	N				
Previous CTGs reviewed	Y/N /NA		SROM: Y/N Date_____ Time_____ Liquor colour: Hours ruptured:	Impression		Normal	Abnormal		Chronic hypoxia suspected
Management plan:									
Signature 1:			Signature 2:			Date:		Time:	

3.1.6 Abnormal antenatal CTG - Actions to take:

- Escalate to shift lead, Obstetric registrar/Consultant
- Continue CTG
- Consider:
  - ➢ Conservative measures
  - ➢ Escalation to LW coordinator
  - ➢ Transfer to appropriate setting (either for increased observation or expedited birth)
- If Chronic hypoxia is suspected: See flow chart (1)

3.1.7 Flow chart 1 – Chronic Hypoxia



3.1.8 Fetal heart auscultation of Women/Birthing people in the latent phase of labour or IOL process:

Initial auscultation of the fetal heart is recommended at first contact in latent phase and at each further assessment undertaken to determine whether labour has become established.

The fetal heart should be auscultated as part of an assessment of fetal wellbeing according to any documented management plan or change in clinical circumstances, e.g., pre and post any intervention e.g. vaginal examination and prior to the administration of intramuscular analgesia

- Low risk woman/birthing person in the latent phase of labour: regular, appropriate clinical assessment must be offered (e.g. maternal wellbeing, pain assessment, palpation of contractions, assessment of fetal movements)
- For high-risk pregnancies and induction of labour – a plan of care which includes fetal monitoring care plan should be documented by the obstetric team
- For Women/Birthing people/birthing people experiencing delay in IOL process – daily CTG must be offered, and appropriate clinical assessment must be offered each shift (early/late/ night – minimum) assessment should include: maternal wellbeing check, pain assessment, palpation of contractions, assessment of fetal movements, fetal heart auscultation/CTG dependent on individual risk factors and clinical assessment
- Women/birthing people who have had previous LSCS may require continuous CTG in latent phase if they are experiencing regular painful contractions.

3.2 Intrapartum fetal heart rate monitoring

3.2.1 Risk assessment:

Risk assessment **must** be performed on admission to determine appropriate method of fetal monitoring in labour (IA or CTG)

Review antenatal notes	Review antenatal bloods	Review current situation	Discuss mother's wishes

Antenatal history: Any pre-existing fetal or maternal risk factors? **YES/NO**
If yes – do they indicate continuous fetal monitoring

Clinical assessment on admission:
Maternal observations including urinalysis within normal limits?

Vaginal loss:
SROM, time date, colour Other
PV loss,
blood/discharge

Palpation:
Fundal height (if indicated), presentation, position, engagement

Pain (not contractions):
Location, Pain score, constant, Previous CS? Scar
pain **Contractions:**
Regular/irregular, length, strength, and frequency

FH:
Record rate as single figure (document maternal pulse taken simultaneously)

Fetal movements:
Last 24 hours/previous admissions for reduced FM (normal/reduced/absent)

VE:
Cervical length/position/consistency/station and position of PP/dilatation

Management plan: Document method of auscultation and indication including discussion with woman (and Obstetrician/senior Midwife if required)

If no risk factors present – intermittent auscultation (IA) is an appropriate method of fetal monitoring, continue with IA unless risk factors develop during labour (see 'Fresh Ears' tool and full fetal monitoring guideline)

Escalate all abnormal findings as per guideline

3.2.2 Intrapartum risks

Inclusion criteria for use of Electronic Fetal Monitoring	
Maternal indication	**Fetal Indication**
Gestation <37 or ≥ 42 weeks	Abnormal Doppler artery velocimetry
Induced / augmented labour (low risk service users with post-dates induction may be suitable for IA)	Known or suspected IUGR
Administration of oxytocin	Oligohydramnios or polyhydramnios
Pre-eclampsia	Multiple pregnancy (all babies to be monitored)
Ante/Intrapartum haemorrhage	Meconium-stained liquor
Maternal illness (e.g., diabetes, cardiac, renal, hyperthyroidism) *	Malpresentation
Previous uterine scar (caesarean section or myomectomy)	Suspected small for gestational age or tailing growth
Contractions ≥ 5:10 or lasting for more than 90 seconds	Reduced fetal movements in the last 24 hours reported by the woman
Epidural	Fetal structural abnormalities diagnosed during the antenatal period and planned for CEFM
Prolonged rupture of membranes > 24 hours unless delivery is imminent.	A rise in baseline, repeated decelerations or slow to recover decelerations, or overshoots
Maternal request	Low PAPPA even when growth scan normal

*Approach to fetal monitoring as advised by consultant in management plan.

The table above is not exhaustive, any condition which is thought to increase the risk of fetal hypoxia mandates EFM

3.2.3 Intermittent Auscultation (IA)

For a woman who is healthy and has had an otherwise uncomplicated pregnancy, IA should be offered and recommended in labour to monitor fetal wellbeing in all birth settings.

Carry out intermittent auscultation **immediately after a contraction for at least 1 minute and record as a single figure**.
Count for a full minute, do not rely on the range shown on handheld doppler screen as this can be inaccurate.

Timing of auscultation

- Minimum - Every 15 minutes in the 1st stage of labour
- Minimum - Every 5 minutes in 2nd stage of labour **(both passive and active)**
- If second stage is suspected due to maternal behaviour but not yet confirmed on vaginal examination, frequency of auscultation should be increased to every 5 minutes (minimum).

Palpate the maternal pulse hourly, or more often if there are any concerns, to differentiate between the maternal and fetal heartbeats (NICE 2017)

IA summary table

Every 5 minutes	Every 15 minutes	Every 30 minutes	Hourly
Document FH as a single figure on eCare during **second** stage of labour	Document FH as a single figure on eCare during **first** stage of labour	FRESH CARE during **second** stage of labour	FRESH CARE during **first** stage of labour
		Frequency and strength of contractions (palpated)	Maternal pulse

Please note:

- Variability cannot be measured when using intermittent auscultation
- The fetal and maternal heart rates should be documented contemporaneously on eCare

3.2.4 Fresh care

Assessment should be performed using the tool provided and documented on eCare (auto text /MATfc), this includes a review of existing and developing risk factors.

- First stage – hourly
- Second stage – every 30 minutes

Have any clinical risk factors developed since the last fresh care assessment (refer to intrapartum risk assessment tool)? YES/NO (document details and escalate if yes)	
Clinical information, consider; Adequate progress in labour (i.e., 2cm over 4hrs, effacement, decent of PP) Liquor colour Contractions palpated (length, strength, frequency) Fetal heart (FH) within normal limits (110-160) Maternal Pulse – palpated simultaneously with FH to differentiate between two heart rates	
Clinical observation	**Action**
No deceleration in FH **No** rising baseline **(review partogram on e-care)** **Stable** baseline **(review partogram on e-care)**	Continue intermittent auscultation as per guideline (see guidance below) Fresh care assessment hourly unless other maternal or fetal risk factors have developed
Audible deceleration (X1) or unsure if deceleration auscultated on IA	Increase the frequency of IA for the next three contractions to determine fetal wellbeing (NICE 2017) Consider escalation to LW coordinator (without leaving room)
Audible decelerations confirmed following increase IA Audible, deep/prolonged deceleration Rising/unstable baseline	Escalate to LW coordinator (without leaving room) Review by Obstetrician Commence CTG for a minimum of 30 minutes Additional maternal observations Conservative measure e.g. change position (left lateral), ensure hydration
Ongoing suitability for IA agreed by two midwives? YES/NO – **If no, escalate to LW coordinator/obstetrician (see actions in red)**	

3.2.5 Risks factors for conversion to EFM

Risk factors indicating conversion from Intermittent Auscultation to Continuous Electronic Fetal Monitoring	
Maternal	**Fetal**
*Pulse over 100 beats/minute on 2 occasions 30 minutes apart	Undiagnosed breech presentation; transverse or oblique lie (review mode of delivery)
*Blood pressure above 140/90mmHg on 2 consecutive readings taken 30 minutes apart	Free-floating head in a nulliparous woman
*A single reading of diastolic blood pressure ≥ 110mmHg or systolic blood pressure ≥ 160 mmHg	Recurrent Accelerations (immediately following a contraction i.e., overshoot)
Maternal pyrexia (defined as 38.0 °C once or >37.5°C on two occasions 1 hour apart)	Fetal heart rate below 110 or above 160 beats/ minute, or if it is perceived as inappropriate for gestational age as compared to most recent antenatal assessment.
Any vaginal blood loss other than a show	The presence of meconium
Persistent pain in between contractions	Evidence of a rising baseline on the partogram of more than 10% from the initial baseline
Epidural	Decelerations in fetal heart rate heard on intermittent auscultation after 2 successive contractions
Oxytocin use	
Maternal dehydration requiring IV fluids	

* Measured between contractions

3.2.6 Continuous electronic fetal monitoring

The fetal heart rate should be auscultated with a pinard or handheld doppler prior to commencing a CTG, to ensure fetal heart sounds are confirmed.

Key information must be documented on the CTG on commencement using the CTG commencement sticker (appendix 2).

Key events should be annotated on the CTG to clearly identify fetal response to event. Maternal pulse should be recorded continuously using oximeter where possible. Where not possible the maternal pulse **palpation** should be documented on the CTG and on eCare hourly (minimum).

Any queries regarding the fetal heart rate: a pinard should be used again to confirm and this should also be clearly documented.

When discontinuing, document the date, time and mode of birth, the outcome and signature to confirm details.

3.2.7 Review, interpretation, and documentation: Continuous EFM (CTG)

Every 15 minutes	Every 30 minutes	Hourly
Document FH as a single figure on eCare during **first** stage of labour	FRESH EYES during **second** stage of labour	FRESH EYES during **first** stage of labour
	Frequency and strength of contractions (palpated)	Maternal pulse

CTG traces should be reviewed by the MW every 30 minutes or sooner if there are concerns (document on e-Care).

3.2.7.1 FRESH EYES

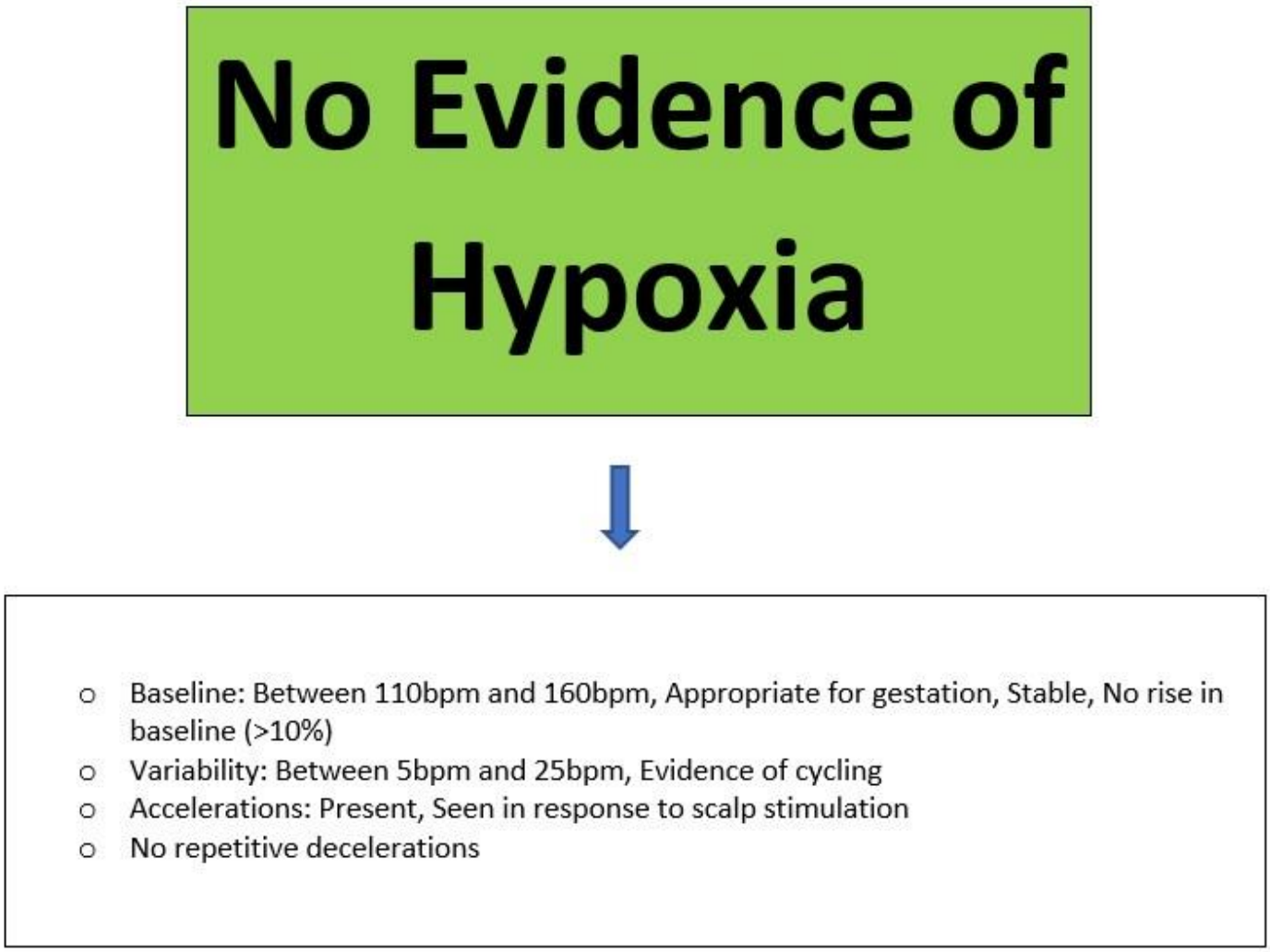
Assessment must be performed between two clinicians (MW or Obstetrician, Band 5 MW should only do FRESH EYES with band 6 MW or above or Registrar or Consultant), hourly in first stage of labour and **every 30 minutes during second stage**.

Intrapartum FRESH EYES CTG assessment					
Date: **Time:** **Telemetry in use Yes/No**			**Good trace quality:** FH – Yes/No FSE required Y/N/in situ Contractions recording: Yes/No		**Evidence of chronic hypoxia?** Yes/No
Maternal heart rate:	**SROM: Y/N** **Date** _____ **Time** _____ **Liquor colour:** **Hours ruptured:**		**Fetal movements in last 24hrs:** Normal/reduced/ pattern change		**Stage of labour:** First/Second:
Risk Factors					
Maternal: Pre-eclampsia/Diabetes/ Maternal tachycardia/ Maternal pyrexia	**Fetal:** IUGR/PSROM/		**Intrapartum:** Previous CTG concerns/ meconium liquor/ slow progress/APH/epidural		**Other:**
Contractions palpated	_____: 10 mins	Lasting:_____secs	Reg/Irregular/ Strong/Mod/Mild	Inter-contraction rest: ≥90 secs Y/N	Oxytocin Y/N rate_____mls/hr
Baseline	Current rate: _____ bpm	Appropriate for gestation Y/N	Stable Y/N	Previous CTG baseline rate: ____ bpm Previous AN fetal heart review: ____bpm	Baseline rise ≥ 10%
Variability	_____bpm	Normal/Reduced/Absent/ Increased (saltatory)/Sinusoidal			Cycling present Y/N
Accelerations	Present/Absent	Present with stimulation (e.g., VE/palpation): Y/N/NA			
Decelerations	None	Baroreceptor mediated	Chemoreceptor mediated		
Impression – How is this baby?					
No evidence of hypoxia	**Gradually evolving hypoxia (compensated)**	**Subacute hypoxia**	**Gradually evolving hypoxia (decompensated)**	**Acute hypoxia**	
Assessment for INTRAPARTUM CHORIOAMNIONITIS: PSROM Y/N, Maternal tachycardia Y/N, Maternal pyrexia Y/N, Meconium Liquor Y/N					
No evidence of chorioamnionitis Baseline appropriate for gestation Cycling present Variability normal No evidence of hypoxia	**Chorioamnionitis (amber alert)** Baseline high for gestation or risen ≥10% Stable baseline with no preceding decelerations Cycling present/variability normal No evidence of hypoxia		**Chorioamnionitis (red alert)** Baseline rise ≥10% and continuing to rise Cycling absent/reduced variability Evidence of hypoxia		
Management plan:					
Signature 1:	**Signature 2:**		**Agreement with interpretation: Y/N** **If N – escalation required**		

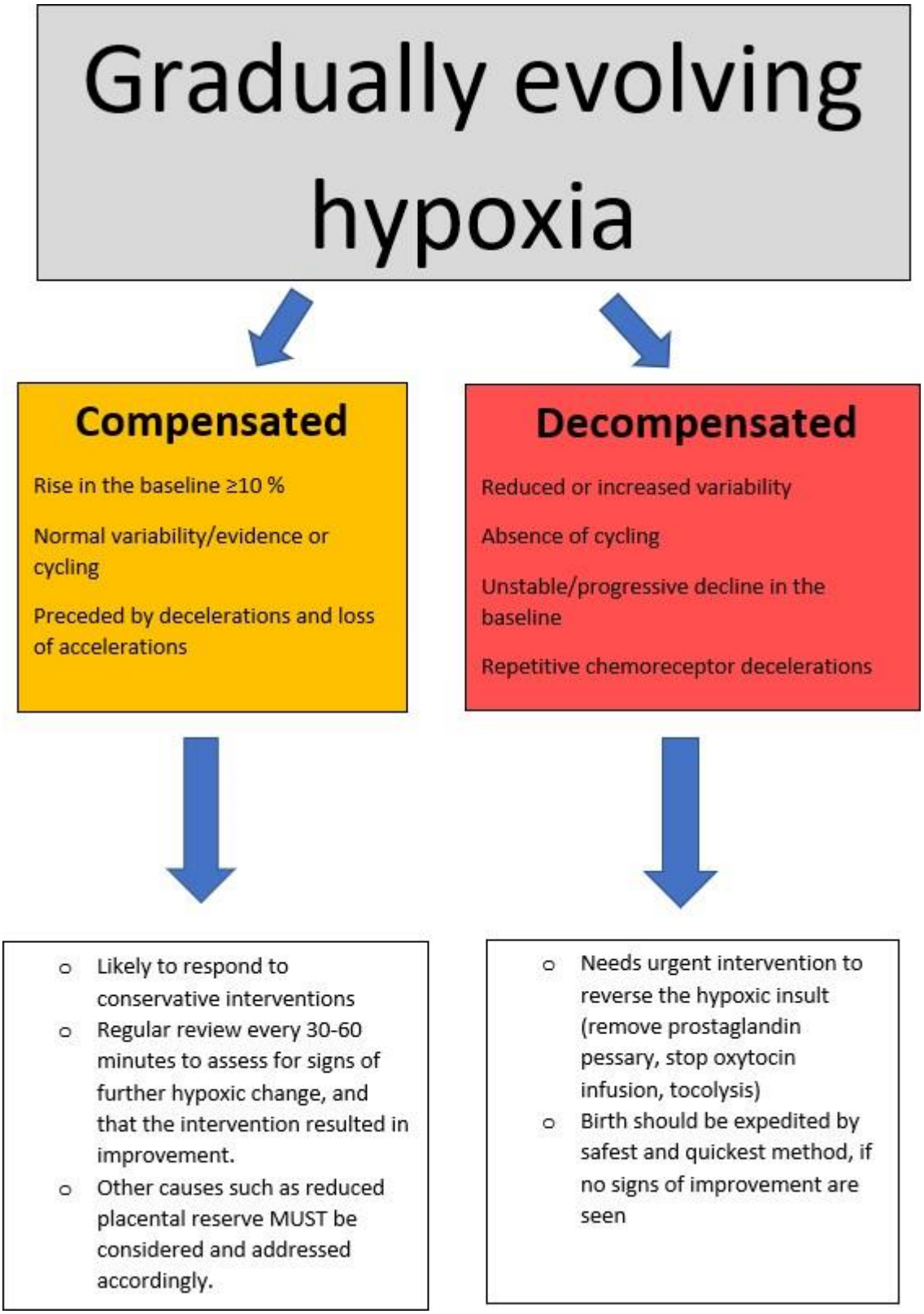
3.2.8 Impression

Baseline Rate	• Between 110bpm and 160bpm • Appropriate for gestation • Stable • No evidence of rise in baseline (>10%)	• Risen more than 10% usually WITH preceding decelerations	• More time spent during decelerations than at baseline	• Higher than expected for gestation	• Unstable baseline • Progressive decline in baseline	~	• Risen more than 10% usually without preceding decelerations	• Risen more than 10% usually without preceding decelerations and continuing to rise
Variability	• Between 5bpm and 25bpm • Evidence of cycling	• Between 5bpm and 25bpm • Evidence of cycling	• Often associated with salutatory pattern / increased variability	• Reduced • Absence of cycling	• Reduced or increased variability • Absence of cycling	Reduced / absent variability within the deceleration	• Between 5bpm and 25bpm • Evidence of cycling	• Reduced • Absence of cycling
Accelerations	• Present • Seen in response to scalp stimulation	• Loss of accelerations	• Absent	• Absent	• Absent	~	• Present • Seen in response to scalp stimulation	• Loss of accelerations
Decelerations	• No repetitive decelerations	• Initially baroreceptor mediated decelerations which may progress to chemoreceptor	• More time spent in deceleration than on the baseline	• Shallow decelerations	• Repetitive chemoreceptor mediated decelerations	• Prolonged deceleration >3 minutes	• Usually none but presence of decelerations shows coinciding hypoxia	• Usually none but presence of decelerations shows coinciding hypoxia
	No Evidence of Hypoxia **No Evidence of Chorioamnionitis**	**Gradually evolving hypoxia Compensated**	**Subacute Hypoxia**	**Chronic Hypoxia**	**Gradually evolving Hypoxia Decompensated**	**Acute Hypoxia**	**Amber Alert Chorioamnionitis**	**Red Alert Chorioamnionitis**

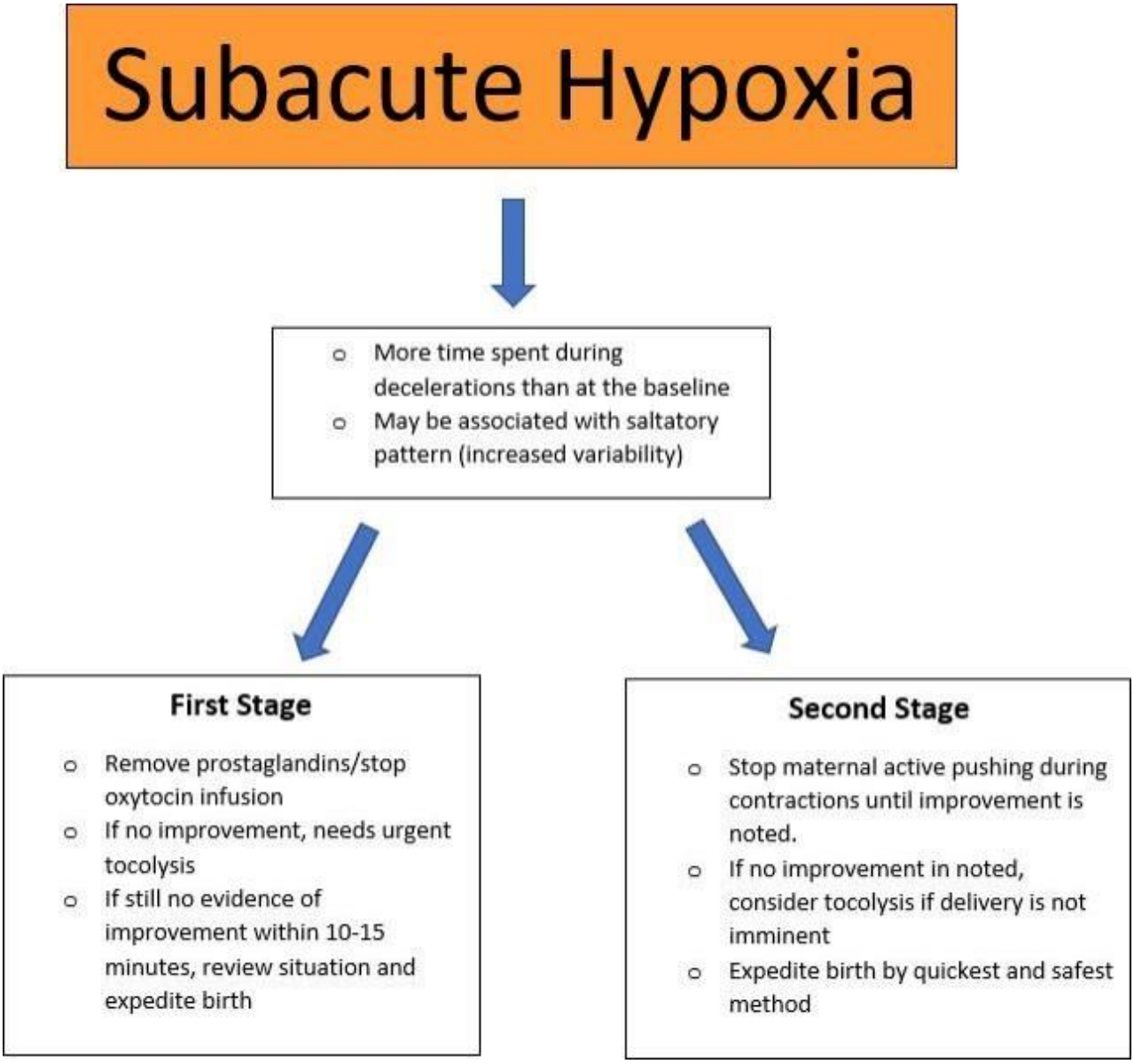
3.2.9 Flow chart 1 – No Evidence of Hypoxia



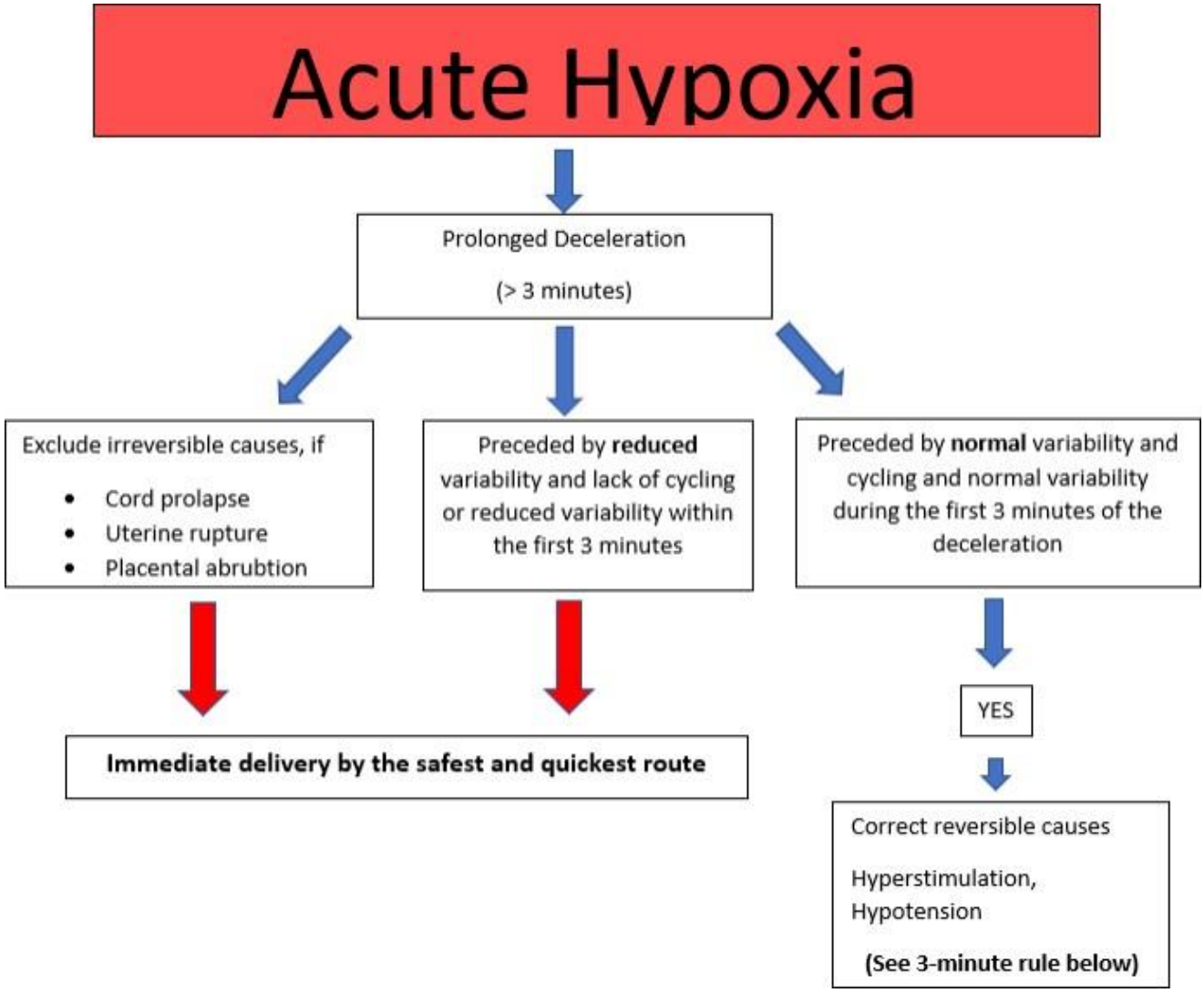
3.2.9 Flow chart 2 – Gradually evolving hypoxia



3.2.11 Flow chart 3 – Subacute hypoxia



3.2.12 Flow chart 4 – Acute hypoxia



0 – 3 minutes:

- If a deceleration is noted for more than 3 minutes with no signs of recovery despite conservative measures (change in position, IV fluids, stop oxytocin), the emergency bell should be pulled to summon help

3 – 6 minutes: Identify cause of deceleration if possible:

- If a non-reversible cause is identified, proceed with immediate delivery via the fastest and safest route
- If a reversible or physiological cause is identified, immediate measures must be utilised to correct the changes. This includes avoiding supine position, stopping uterine stimulants, starting IV fluids, and administering tocolytics as required

6 – 9 minutes: Signs of recovery should be noted (return of variability and improvement in heart rate). If no signs of recovery are noted, preparation for immediate delivery, via the safest and fastest route MUST be started.

9 – 12 minutes: If the deceleration has not recovered, delivery should be expedited immediately through the safest and fastest route possible.

3.3 Management of suspected chorioamnionitis

Clinical or subclinical chorioamnionitis may be suspected due to features noted on the CTG or by maternal signs and symptoms. Management needs to be tailored to the clinical picture as some features will prompt an AMBER ALERT requiring investigation and treatment while allowing labour to continue, while other features will indicate RED ALERT where investigations and treatment is required but preparations for delivery should be made simultaneously.

Note:

- When suspecting chorioamnionitis, the presence of preceding decelerations may show coinciding hypoxia
- The presence of meconium may reduce the antibacterial properties of the predisposing the fetus to chorioamnionitis. Further to this, consideration needs to be given to the possibility of meconium aspiration syndrome which is increased risk when present with evidence of fetal hypoxia

3.3.1 Flow chart 5 – Chorioamnionitis AMBER ALERT Management

Chorioamnionitis (AMBER ALERT)

Baseline high for gestation or risen ≥10%

Stable baseline with no preceding decelerations

Cycling present/variability normal

No evidence of hypoxia

Initial investigations/treatment: Refer to: The Management of Maternal Pyrexia and Sepsis guideline

Full MDT discussion: **Review clinical picture** —including maternal observations and clinical risks

IV access for bloods – FBC, CRP, lactate (VBG)

Further investigations/treatment— Consider:

IV antibiotics

IV fluids

O_2 therapy

Blood cultures (if pyrexial >38°C)

MSU/CSU

LVS

Throat Swab

Management:

- Labour may continue if progressing well and delivery is anticipated within the next 3-4 hours or CTG improves
- In the presence of thick meconium and signs of infection it is vital labour is progressing well, expedited delivery should be considered if spontaneous birth is not anticipated soon.
- If labour is not progressing, avoid the use of oxytocin, instead expedite delivery.
- If oxytocin is already in use, it is vital to avoid fetal hypoxia, contractions need to be monitored closely to ensure suitable strength and adequate rest time.
- Cycling must be closely observed. The absence of cycling and reduced variability, as well as signs of hypoxia, will change management (see Chorioamnionitis—RED ALERT)

Post delivery:

MDT discussion to plan continued management

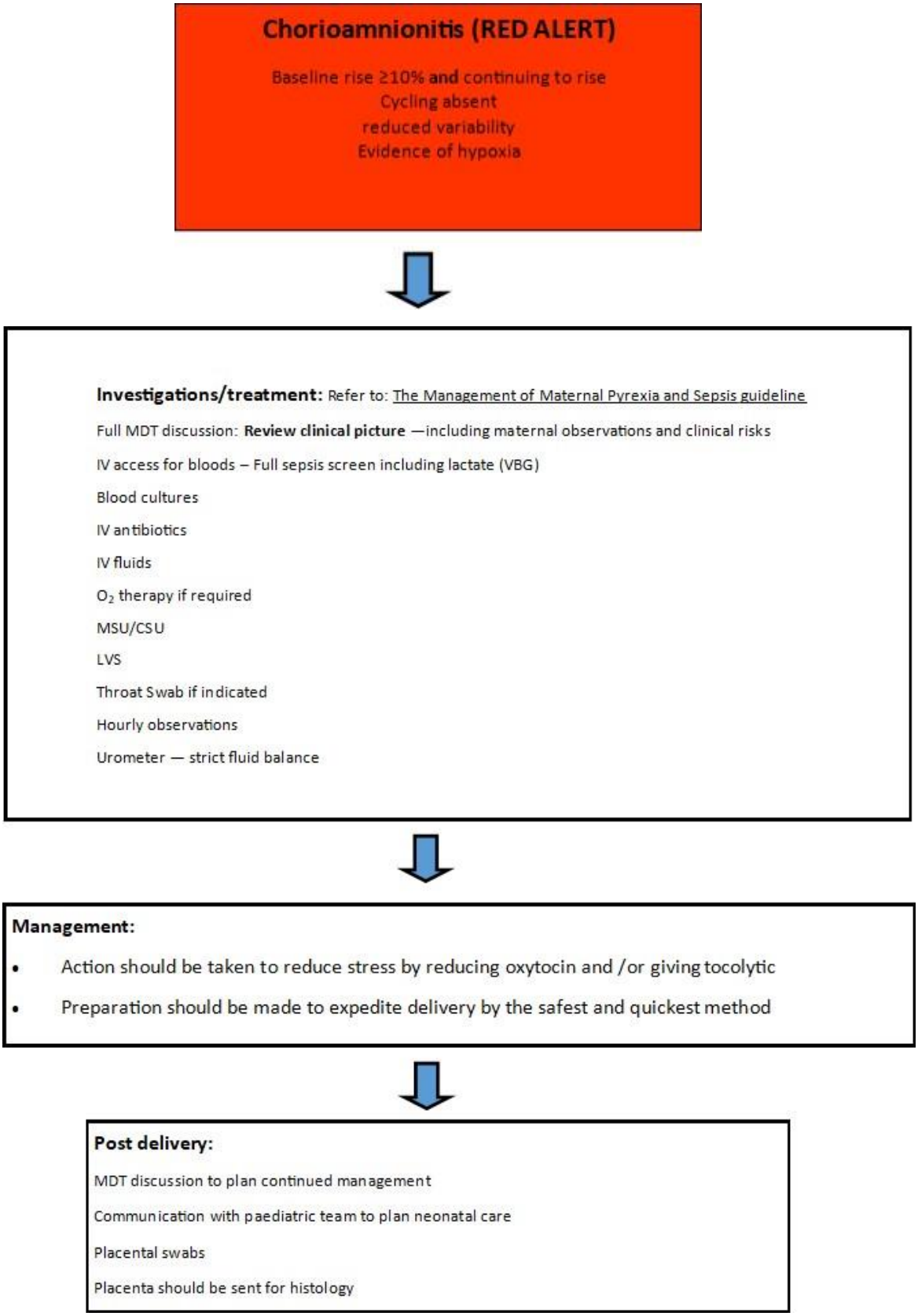
Communication with paediatric team to plan neonatal care

Placental swabs

Placenta should be sent for histology

3.3.2 Flow chart 6 - Chorioamnionitis RED ALERT Management

Signs of advancing fetal hypoxia – The presence of fetal hypoxia alongside the presence of chorioamnionitis increases the risk of HIE by 78 times.



3.3.3 Maternal Pyrexia

Management of a suspected chorioamnionitis should be as per 3.3.1 and 3.3.2.

A maternal infection such as UTI or throat infection will likely become evident from maternal signs and symptoms before the fetus shows signs in the fetal monitoring.

Fetal temperature is estimated to be between 0.3 – 0.5°C greater than the maternal temperature. In the presence of maternal pyrexia fetal tissues have an increased metabolic demand and therefore are more susceptible to hypoxia.

In the event of fetal acidosis (low cord pH at birth), the risk of neonatal encephalopathy is significantly increased if the mother experienced pyrexia in labour.

Management of a woman with a raised temperature should include IV fluids, IV paracetamol and IV antibiotics.

There is no conclusive evidence regarding the acceptable time frame for delivery in the presence of maternal pyrexia, but it is generally accepted that prolonged labour should be avoided, and discussions should be held with the mother regarding the possible implications.

3.4 Additional clinical factors:

3.4.1 Oxytocin

The use of oxytocin is associated with 70% medico-legal claims as clinicians are responsible for the safety of its use. Oxytocin should be carefully managed as per the **Induction of labour** guideline. Oxytocin is designed to increase the frequency and strength of contractions to facilitate adequate progress.

- Consideration needs to be given to ensuring the fetus is managing with the increased contractions as well as the increased basal tone of the uterus.
- Contractions of 4:10, moderate on palpation should be the maximum intensity achieved. Inter-contraction rest duration should be at least 90 seconds. Increasing the oxytocin in the face of fetal heart concerns is not an acceptable stress test for the fetus.
- Subacute hypoxia is invariably caused by hyperstimulation as this reduces the rest time between the contractions meaning the fetus has reduced blood supply for longer and less time to recover before blood supply is again reduced, therefore adequate rest time is paramount.
- During second stage, consideration should be made to reduce the oxytocin infusion if it is apparent the contractions suddenly increase due to the Fergusons reflex as this can also cause subacute hypoxia.

3.4.2 Meconium

Meconium presents potential complications for the newborn, specifically meconium aspiration syndrome

Meconium stained liquor can be an indication a sign that the fetus has been exposed to hypoxic stress in-utero, however it should be remembered that it can occur in post term pregnancies without a pathological cause.

The presence of meconium in liquor, inhibits the antibacterial properties of the liquor and allows the proliferation of E Coli and Group B Streptococcus therefore the risks of chorioamnionitis are increased.

If meconium is present in a pre-term pregnancy <34/40, it is an indication of likely infection such as listeria or rotavirus.

Fetal tachycardia or a fetal baseline deemed unsuitable for gestation with the presence of meconium stained liquor has been linked to an increased incidence of chorioamnionitis, in comparison to clear liquor.

Fetal gasping can occur as a response to periods of low placental oxygen supply, and CEFM cannot accurately predict whether a fetus was at a higher risk of gasping. In view of this, there should be a lower threshold for delivery in the presence of any signs of hypoxic stress, even if it is not suspected that the fetus is acidotic.

With meconium stained liquor in a fetus <37/40 with any signs of hypoxia OR infection, delivery by quickest and safest means should be considered.

3.4.3 Previous Caesarean Section

For service users with a previous caesarean section, CTG changes may be one of the first signs of uterine dehiscence/ rupture. The consideration of rupture should be included in the assessment of the CTG, particularly if there is a rapid deterioration in the monitoring.

Continuous CTG in latent phase should be considered in the presence of regular painful contractions.

3.4.4 Antepartum Haemorrhage (APH)

Significant APH may be an indication of placental abruption and is one of the 3 major intrapartum accidents and may present as a single and sudden drop in the baseline rate (acute hypoxia). In this case, delivery must be expedited as it is most likely to be the evidence of a placental abruption and is irreversible.
It is important to note that the use of tocolytics in APH may aggravate placental separation causing worsening fetal hypoxia.

Placental abruption can be concealed, and clinical presentation may be constant abdominal pain or reduced fetal movements.

CEFM may also demonstrate an 'irritable uterus' with frequent and short lasting contractions.

3.4.5 Preterm

CEFM in extremely premature babies is not currently recommended (23-26 weeks). The immaturity of the central and peripheral nervous system results in a higher baseline rate and reduced variability, with blunted responses. Accelerations and decelerations may be of smaller amplitude (10bpm) and shorter duration (10 seconds), and sleep/wake cycling may not be demonstrated.

3.4.6 Multiple Pregnancy

Consideration needs to be taken to ensure each baby is monitored as it is common for ultrasound waves from the transducer to monitor the same baby. An FSE on the presenting fetus may be appropriate. If in doubt, the Midwife must escalate to Obstetric team.

4.0 Statement of evidence/references

References:

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7. National Institute for Health and Care Excellence. (2017) Intrapartum care: care of healthy women and their babies during childbirth NICE clinical guideline 190.

8. National Institute for Health and Clinical Excellence (2019) Intrapartum care for women with existing medical conditions or obstetric complications and their babies (NICE guideline (NG121)

9. NHS England (2016) Saving Babies Lives. NHS England. London

10. Nursing and Midwifery council (NMC). (2015). *The Code. Professional standards of practice and behaviour for nurses and midwives.* Available at: http://www.nmc.org.uk/globalassets/sitedocuments/nmc-publications/revised-new-nmc-code.pdf

11. Physiological CTG Interpretation. Intrapartum fetal monitoring guideline. Feb 2018

12. Walsh D CTG use in intrapartum care: assessing the evidence. British Journal of Midwifery 16(6): 367-369 (2008).

External weblink references:

Please note that although Milton Keynes University Hospital NHS Foundation Trust may include links to external websites, the Trust is not responsible for the accuracy or content therein.

physiological-ctg.com

5.0 Governance

5.1 Document review history

Version number	Review date	Reviewed by	Changes made
8.1	Nov 2022	Georgena Leroux	Wording and updates to stickers
8	May 2022	Georgena Leroux and Joyce Elliot	Full document rewritten in accordance with national guidance and standards.

5.2 Consultation History

Stakeholders Name/Board	Area of Expertise	Date Sent	Date Received	Comments	Endorsed Yes/No
Melissa Davis	Head of Midwifery	Feb 22	March 22	Clinical content and clarity	Yes
Anja Johansen-Bibby	Consultant Obstetrician	Feb 22	March 22	Clinical content and clarity	Yes
Lauren Mitchel	Consultant Midwife	Feb 22	March 22	Clinical content and clarity. Inclusivity	Yes
Jessica Matson	Midwife	Feb 22	March 22	Clinical content and clarity	Yes
Katie Selby	Governance lead	Feb 22	March 22	Clinical content and clarity	Yes

5.3 Audit and monitoring

Audit/Monitoring Criteria	Tool	Audit Lead	Frequency of Audit	Responsible Committee/Board
Compliance report for attendance at fetal monitoring SD including assessment	Compliance report	Fetal surveillance MW, Governance admin	Monthly rolling report with annual submission	Maternity governance report to CSU MIS submission
Compliance report for fetal monitoring effectiveness	Audit to evidence: Risk assessment at onset of labour Use of interpretation tools Documentation Appropriate management Use of FRESH EYES and FRESH care (hourly minimum)	Fetal surveillance leads	3 monthly/Annual summary	Audit meeting – annual summary presentation MIS submission
Reduced fetal movements	Audit 20 sets of notes to evidence use of DR analysis with admissions for reduced/changed fetal movements	Fetal surveillance leads	Annual	MIS submission
Training compliance	90% staff trained to use FM equipment	Fetal surveillance leads	Annual	MIS submission

5.4 Equality Impact Assessment

As part of its development, this Guideline and its impact on equality has been reviewed. The purpose of the assessment is to minimise and if possible remove any disproportionate impact on the grounds of race, gender, disability, age, sexual orientation, religion or belief, pregnancy and maternity, gender reassignment or marriage and civil partnership. No detriment was identified. Equality Impact assessments will show any future actions required to overcome any identified barriers or discriminatory practice.

Equality Impact Assessment			
Division	Women and Children's	Department	Maternity
Person completing the EqIA	G Leroux	Contact No.	86473
Others involved:	J Elliot	Date of assessment:	17/3/22
Existing policy/service	Yes	New policy/service	No

Will patients, carers, the public or staff be affected by the policy/service?	Yes
If staff, how many/which groups will be affected?	All maternity staff

Protected characteristic	Any impact?	Comments
Age	NO	Positive impact as the policy aims to recognise diversity, promote inclusion and fair treatment for patients and staff
Disability	NO	
Gender reassignment	NO	
Marriage and civil partnership	NO	
Pregnancy and maternity	YES	
Race	NO	
Religion or belief	NO	
Sex	NO	
Sexual orientation	NO	

What consultation method(s) have you carried out?
Circulation via email, through governance consultation process, discussion at guideline meeting and CIG
How are the changes/amendments to the policies/services communicated?
Circulation via email, through governance consultation process, discussion at guideline meeting and CIG, FM leads face to face, notice boards, FM study day
What future actions need to be taken to overcome any barriers or discrimination?

What?	Who will lead this?	Date of completion	Resources needed
Review date of EqIA	May 2025		

Appendix 1 Definitions

- **Accelerations:**
  An abrupt increase of at least 15 bpm in fetal heart rate (FHR) above the baseline. Time from the onset to the peak is less than 30 seconds and duration is equal to or more than 15 seconds and less than two minutes from onset to return to baseline. Accelerations lasting 10 minutes or more are considered a baseline change
- **Bradycardia:**
  A baseline rate below 110bpm lasting more than 10 minutes. Baseline rate of 100–110bpm may occur in normal fetuses especially if postdates however all other features should be normal
- **Cardiotocograph (CTG):**
  Fetal heart and uterine activity trace produced through the use of continuous electronic fetal monitoring (EFM)
- **Chorioamnionitis:** The presence of infection in the fetal compartment. It is a fetal disease and a significant cause of non-hypoxic fetal compromise. Maternal symptoms may indicate advanced fetal infection.
  - Clinical chorioamnionitis - Usually defined as Maternal temperature of >38°C with one of following signs: Maternal tachycardia (>100/min, Fetal tachycardia >160/min,Leucocytosis >15x109 cells/l, offensive liquor, tender uterus.
  - Subclinical chorioamnionitis - Encompasses any other features in absence of maternal pyrexia e.g. maternal tachycardia (>100bpm where other causes like dehydration or pain has been excluded) or fetal tachycardia (>160/min for any gestation), a persistent rise in the baseline for the given gestation or a persistent increase in the baseline fetal heart rate during labour of >10% without preceding CTG signs of hypoxia (be aware that chorioamnionitis and hypoxia can happen simultaneously), tender uterus, offensive/meconium stainedliquor.
- **Continuous electronic fetal monitoring (EFM):**
  The use of electronic equipment to monitor the fetal heart rate continuously
- **Cycling:**
  Alternating periods of activity and quiescence characterized by normal and reduced baseline FHR variability
- **Dawes Redman (DR):**
  Computerised tool used for analysis of antenatal CTG trace
- **Decelerations:**
  A drop-in heart rate of more than 15 beats, lasting for more than 15 seconds

Please note: shallow decelerations of less amplitude can be associated with reduced variability and/or raised baseline, these are usually considered ominous

- **Fetal Heart Baseline:**
  The approximate mean fetal heart rate assessed over a period of 10 minutes, rounded to increments of 5bpm. It can fluctuate between 10-20 beats over an hour. Preterm fetuses often display values towards the upper end of the scale and post-term fetuses towards the lower end

- **Fetal hypoxia:** This can be categorised into the following four categories which are discussed more in length further in this guideline.
  - **Chronic hypoxia:** A condition which can be associated with conditions which cause placental insufficiency, fetal-maternal haemorrhage, pre-eclampsia and placental abruption. Cases with chronic hypoxia often present with reduced fetal movements as the fetus is trying to reduce expenditure of energy.

  - **Gradually evolving hypoxia:** This is the most common cause of hypoxia in labour, the fetus demonstrates a progressive response to stress, initially there will be evidence of compensation and management should depend on the stage of the suspected hypoxia and what features are evident on the CTG.

  - **Subacute hypoxia:** A condition usually caused by hyperstimulation or maternal pushing during which the recovery period between contractions is inadequate and the fetal heart rate spends more time in decelerations than at the baseline rate. Fetal pH drops at a rate of 0.01 every 2-3 minutes.

  - **Acute hypoxia:** A severe and sudden interruption to the fetal oxygen supply. Fetal pH drops at a rate of 0.01 per minute.

- **Shouldering:**
  Periodic increase in fetal heart rate before and after a deceleration

- **Hypertonia / Uterine Hypertonus:**
  Referring to a sustained uterine contraction lasting >60 seconds and has the potential to cause a prolonged deceleration

- **Intermittent Auscultation (IA):**
  The periodic monitoring of the fetal heart using either a Pinard stethoscope or handheld electronic Doppler

- **Prolonged Deceleration:**
  A decrease in fetal heart rate below the baseline lasting more than 3 mins

- **Pseudo-sinusoidal Pattern:**
  Pattern resembling the sinusoidal pattern but with a jagged "saw-tooth" appearance rather than the smooth sine-wave form. Its duration seldom exceeds 30 min and it is characterised by normal patterns before and afterwards

- **Repetitive Decelerations:**
  Occur with more than 50% of contractions.

- **Baseline rise:**
  An increase in baseline heart rate by more than 10%

- **Sinusoidal Pattern:**
  A regular, smooth, undulating signal, resembling a sine wave, with amplitude of 5-15bpm, and a frequency cycle of 3-5 cycles per minute. This pattern lasts more than 30 minutes and coincides with absent accelerations

- **Tachycardia:**
  A baseline rate above 160 bpm for more than 10 minutes, often associated with maternal pyrexia or infection

- **Tachysystole:**
  Referring to the presence of 5 or more contractions in 10 minutes in the absence of changes to the fetal heart

- **Uterine Hyperstimulation:**
  Referring to the presence of 5 or more contractions in 10 minutes with changes suggestive of hypoxia on the fetal heart rate

- **Variability:**
  Fluctuations in the fetal heart rate (FHR) baseline that are irregular in amplitude and frequency. This can be assessed by selecting a one minute segment of trace, without accelerations or decelerations and measuring the difference between the highest and lowest rate

Appendix 2 Start/End stickers

CTG commenced (attach to start of trace)	**Date:**	**Time:**	**Trace number:**
Machine Check: Machine clean: Y/N Date checked/correct on CTG: Y/N Time checked/correct on CTG: Y/N Paper set to 1cm/min: Y/N Machine number:	**Name:** **Hospital number:** (Or attach addressograph)		
Gestation:	**Maternal pulse** (palpated to differentiate from FH): bpm		
FH auscultated prior to CTG: bpm Pinard/Handheld doppler:	**Admitted to central monitoring Y/N**		
SIGN:	PRINT:	Designation	

CTG discontinued (attach to end of CTG trace)	**Date:**	**Time:**
Impression:		
Management Plan: **Discharged from central monitoring Y/N**		
SIGN:	PRINT:	Designation
SIGN:	PRINT:	Designation