Chapter 17

FETAL HEALTH SURVEILLANCE IN LABOUR

In an effort to improve the health of newborn babies, the last 30 years has seen a steady increase in the use of continuous electronic monitoring in labour. The introduction of Electronic Fetal heart rate Monitoring (EFM) was undertaken with the best of intentions, but before the efficacy of electronic heart rate monitoring had been evaluated. There is now clear evidence that EFM in labour leads to higher incidence of interventions without increased benefit to the fetus when compared to intermittent auscultation. A comprehensive review of all randomized controlled trials performed to date on electronic fetal monitoring (EFM) has demonstrated that EFM, with or without fetal scalp blood sampling, is more likely to result in a caesarean birth, an operative birth and administration of general anaesthesia.[1]

Recommendations

Abstracted from SOGC Practice Guideline No.197, September 2007

Intrapartum Fetal Assessment

1. Women in active labour should receive continuous close support from an appropriately trained professional. One-to-one nursing/midwifery care is recommended during the active phase of labour, recognizing the presence of two patients, the woman and her baby.

2. Intermittent auscultation following an established protocol of surveillance and response is the preferred method of fetal surveillance in healthy term women in spontaneous labour in the absence of risk factors for adverse perinatal outcome.

3. Intermittent auscultation may be used to monitor the baby when epidural analgesia is used during labour provided that a protocol is in place for frequent IA (e.g., every 5 minutes for 30 minutes after epidural initiation and after bolus top-ups as long as maternal vital signs are normal).

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1 (please see) Alfirevic Z. Devane D, Gyte GML. Continuous cardiotography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour. *Cochrane Database of Systematic Reviews 2006*, Issue 3, Art. No. CD006066. DOI: 10/1002/14651858.CD006066. Originally published online 19 July 2006. [www.mrw.interscience.wiley.com/Cochrane/clsysrev/articles/CD06066/abstract.html

4. Admission fetal heart rate tracings are not recommended for healthy women at term in labour in the absence of risk factors for adverse perinatal outcome, as there is no evidence of benefit.

5. Admission fetal heart rate tracings are recommended for women with risk factors for adverse perinatal outcome.

6. Continuous EFM is recommended for pregnancies at risk of adverse perinatal outcome.

7. When a normal tracing is identified, it may be appropriate to interrupt the EFM tracing for up to 30 minutes to facilitate periods of ambulation, bathing or position change, providing that (1) the maternal-fetal condition is stable and (2) if oxytocin is being administered, the infusion rate is not increased.

8. Digital fetal scalp stimulation is recommended in response to atypical electronic heart rate tracings.

9. In the absence of a positive acceleratory response with digital fetal scalp stimulation,
    - Fetal scalp blood sampling is recommended when available
    - if fetal scalp blood sampling is not available, consideration should be given to prompt delivery, depending on the overall clinical situation.

10. Where facilities and expertise exist, fetal scalp blood sampling for assessment of fetal acid-base status is recommended in women with 'atypical/abnormal' fetal heart tracings at gestations > 34 weeks when delivery is not imminent, or if digital fetal scalp stimulation does not result in an acceleratory fetal heart rate response.

11. Ideally, cord blood sampling of both umbilical arterial and umbilical venous blood is recommended for ALL births, for quality assurance and improvement purposes. If only one sample is possible it should preferably be arterial.

12. When risk factors for adverse perinatal outcome exist, or when intervention for fetal indications occurs, sampling of arterial and venous cord gases is strongly recommended.

13. Regular updating of fetal surveillance skills is required. Each facility should ensure that updates are interprofessional to ensure common

terminology and shared understanding and to develop the concept of team responsibility.

Recommended Frequency of Auscultation:

- **Every 15 minutes in active phase of first stage of labour, before active pushing**
- **Every 5 minutes in second stage of labour with pushing**

Assess FHR before:	**Assess FHR after:**
• initiation of labour-enhancing procedures (eg. amniotomy)	• admission of patient
• ambulation of patient	• artificial or spontaneous rupture of membranes
• administration of medications	• vaginal examinations
• transfer or discharge of patient	• initiation of oxytocin
	• initiation of analgesia/anaesthesia

Recommended Procedure for FHR Auscultation

The procedure is as follows:

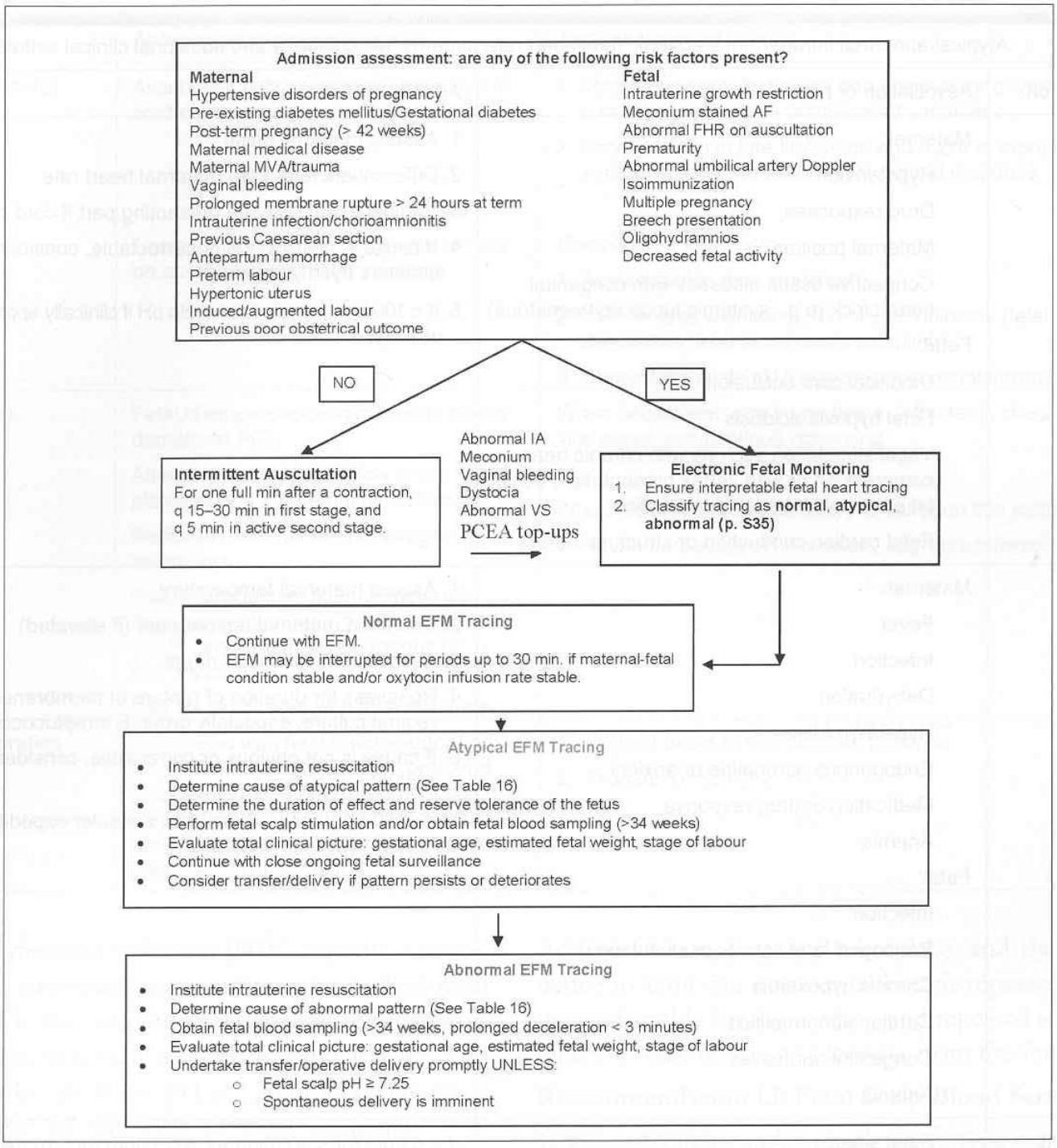
- palpate the maternal abdomen to identify fetal position (Leopold's maneuvers)
- place the Doppler over the area of maximum intensity of fetal heart sounds (usually over the fetal back)
- **place a finger on mother's radial pulse to differentiate maternal from fetal heart rate**
- palpate for uterine contractions during period of FHR auscultation in order to clarify relationship between FHR and uterine contraction
- count FHR between uterine contractions for at least 60 seconds to identify average baseline rate
- to identify fetal response to active labour count FHR after a uterine contraction for 60 seconds every 15 minutes during the active phase until pushing and every 5 minutes in second stage after pushing begins.

Interpretation

	Normal Tracing Previously "Reassuring"	Atypical Tracing Previously "Non-reassuring"	Abnormal Tracing Previously "Non-reassuring"
Baseline	110–160 bpm	Bradycardia 100–110 bpm Tachycardia > 160 for > 30 min to < 80 min. Rising baseline	Bradycardia < 100 bpm Tachycardia > 160 for < 80 min. Erratic baseline
Variability	6–25 bpm ≤ 5 bpm for < 40 min.	≤ 5 bpm for 40–80 min.	≤ 5 bpm for > 80 min. ≥ 25 bpm for > 10 min. Sinusoidal
Decelerations	None or occasional uncomplicated variables or early decelerations	Repetitive (≥ 3) uncomplicated variable decelerations Occasional late decelerations Single prolonged deceleration > 2 min. but < 3 min.	Repetitive (≥ 3) complicated variables: deceleration to < 70 bpm for > 60 secs. loss of variability in trough or in baseline biphasic decelerations overshoots slow return to baseline baseline lower after deceleration baseline tachycardia or bradycardia Late decelerations > 50% of contractions Single prolonged deceleration > 3 min. but < 10 min.
Accelerations	Spontaneous accelerations present (FHR increases >15 bpm lasting > 15 seconds (< 32 weeks' gestation increase in the FHR > 10 bpm lasting >10 seconds) Accelerations present with fetal scalp stimulation	Absence of acceleration with fetal scalp stimulation	Usually absent*
ACTION	EFM may be interrupted for periods up to 30 min. if maternal-fetal condition stable and/or oxytocin infusion rate stable.	Further vigilant assessment required, especially when combined features present.	ACTION REQUIRED Review overall clinical situation, obtain scalp pH if appropriate/prepare for delivery.

*Usually absent, but if accelerations are present, this does not change the classification of tracing.

Management


Admission assessment: are any of the following risk factors present?
Maternal
Hypertensive disorders of pregnancy
Pre-existing diabetes mellitus/Gestational diabetes
Post-term pregnancy (> 42 weeks)
Maternal medical disease
Maternal MVA/trauma
Vaginal bleeding
Prolonged membrane rupture > 24 hours at term
Intrauterine infection/chorioamnionitis
Previous Caesarean section
Antepartum hemorrhage
Preterm labour
Hypertonic uterus
Induced/augmented labour
Previous poor obstetrical outcome
Fetal
Intrauterine growth restriction
Meconium stained AF
Abnormal FHR on auscultation
Prematurity
Abnormal umbilical artery Doppler
Isoimmunization
Multiple pregnancy
Breech presentation
Oligohydramnios
Decreased fetal activity
NO
YES
Intermittent Auscultation
For one full min after a contraction, q 15–30 min in first stage, and q 5 min in active second stage.
Abnormal IA
Meconium
Vaginal bleeding
Dystocia
Abnormal VS
PCEA top-ups
Electronic Fetal Monitoring
1. Ensure interpretable fetal heart tracing
2. Classify tracing as normal, atypical, abnormal (p. S35)
Normal EFM Tracing
Continue with EFM.
EFM may be interrupted for periods up to 30 min. if maternal-fetal condition stable and/or oxytocin infusion rate stable.
Atypical EFM Tracing
Institute intrauterine resuscitation
Determine cause of atypical pattern (See Table 16)
Determine the duration of effect and reserve tolerance of the fetus
Perform fetal scalp stimulation and/or obtain fetal blood sampling (>34 weeks)
Evaluate total clinical picture: gestational age, estimated fetal weight, stage of labour
Continue with close ongoing fetal surveillance
Consider transfer/delivery if pattern persists or deteriorates
Abnormal EFM Tracing
Institute intrauterine resuscitation
Determine cause of abnormal pattern (See Table 16)
Obtain fetal blood sampling (>34 weeks, prolonged deceleration < 3 minutes)
Evaluate total clinical picture: gestational age, estimated fetal weight, stage of labour
Undertake transfer/operative delivery promptly UNLESS:
Fetal scalp pH ≥ 7.25
Spontaneous delivery is imminent

Atypical/abnormal intrapartum electronic fetal heart rate patterns, associations and additional clinical actions		
Pattern definition	Association or potential causes	Additional clinical actions
Bradycardia	Maternal: Hypotension Drug responses Maternal position Connective tissue diseases with congenital heart block (e.g., systemic lupus erythematous) Fetal: Umbilical cord occlusion Fetal hypoxia/acidosis Vagal stimulation such as with chronic head compression or with vertex presentation, occipital posterior or transverse position Fetal cardiac conduction or structural defect	1. Assess maternal pulse 2. Differentiate fetal from maternal heart rate 3. Vaginal exam (elevate presenting part if cord prolapse) 4. If cause is not obvious or correctable, consider intrapartum U/S to evaluate dysrhythmia 5. If < 100 bpm, obtain fetal scalp pH if clinically appropriate/prepare for delivery.
Tachycardia	Maternal: Fever Infection Dehydration Hyperthyroidism Endogenous adrenaline or anxiety Medication or drug response Anemia Fetal: Infection Prolonged fetal activity or stimulation Chronic hypoxemia Cardiac abnormalities Congenital anomalies Anemia	1. Assess maternal temperature 2. Decrease maternal temperature (if elevated) 3. Assess medications or drugs 4. Reassess for duration of rupture of membranes (ROM), positive vaginal culture, especially group B streptococcus (GBS) 5. If cause is not obvious or correctable, consider intrapartum U/S to evaluate arrhythmia 6. If >160 bpm for > 80 minutes, consider expediting delivery
Minimal/absent Variability	Fetal sleep Prematurity Medications (analgesia, sedatives) Hypoxic acidemia	If < 5 bpm for > 80 minutes; ≥ 25 bpm for >10 minutes or sinusoidal: 1. Attach fetal scalp electrode if not already done 2. Obtain fetal scalp pH if clinically appropriate/prepare for delivery
Marked Variability	Mild hypoxia Fetal gasping Unknown	1. Attach fetal scalp electrode if clinically appropriate 2. Obtain fetal scalp pH if clinically appropriate/prepare for delivery
Sinusoidal pattern	Severe fetal anemia (Hb < 70) Tissue hypoxia in fetal brain stem	1. Attach fetal scalp electrode if clinically appropriate 2. Consider APT test or Kleihauer Betke 3. Prepare for delivery
Absent accelerations with fetal scalp stimulation or absent accelerations	Hypoxic acidemia Possible fetal abnormality	1. Attach fetal scalp electrode if not already done 2. Obtain fetal scalp pH if clinically appropriate/prepare for delivery

Pattern definition	Association or potential causes	Additional clinical actions
Variable decelerations	Associated with vagal stimulation due to cord compression.	1. Observe in early first stage and observe for development of combined patterns or complicated variables. 2. Very common in late first stage and occur in more than half of second stages. No action, as a normal response.
	Complicated variable decelerations may be associated with fetal acidemia.	Complicated Variables: 1. Amnioinfusion may ameliorate 2. Confirm fetal well-being, directly or indirectly (fetal scalp stimulation, fetal blood scalp sampling) 3. Obtain fetal scalp pH if clinically appropriate/prepare for delivery
Late decelerations	Fetal chemoreceptor/vagal result due to decreased PO_2 Altered maternal blood flow to the placenta (e.g., maternal hypotension) Reduced maternal arterial oxygen saturation Placental changes altering maternal-fetal gas exchange (e.g., placental insufficiency, uterine hypertonus or tachysystole) May be associated with fetal acidemia	When occasional, ensure mother in left lateral, check maternal vital signs, and continue observing. When repetitive, it is mandatory to act upon this pattern: 1. Obtain fetal scalp pH if clinically appropriate/prepare for delivery
Prolonged deceleration	Associated with fetal baroreceptor and chemoreceptor responses to profound changes in the fetal environment due to uterine hypertonus, unresolving umbilical cord compression, maternal hypotension, maternal seizure, rapid fetal descent.	1. Vaginal exam to rule out cord prolapse 2. Prepare for delivery

Documentation

1. Fetal Heart Rate (FHR) data:
   - numerical baseline rate (in bpm)
   - rhythm (regular or irregular)
   - nature of the changes (gradual or abrupt decelerations)

2. Uterine activity characteristics obtained by palpation:
   - frequency
   - duration
   - intensity
   - relaxation between contractions

3. Specific actions taken when changes in FHR occur

4. Other maternal observations and assessments

5. Maternal and fetal responses to interventions

6. Subsequent return to normal findings

NOTE: ***When FHR data is obtained via EFM, there are descriptive terms assigned to specific, observed FHR changes. Given the absence of validated correlations between auditory FHR changes and specific, named FHR patterns, practitioners are limited in their ability to use those terms in documenting auscultated FHR changes. The lack of research-validated experience coupled with legal risk management concerns make it inadvisable to use EFM terms in documenting subjective observations from auscultated findings. Furthermore, terms such as "asphyxia", "hypoxia", and "fetal distress" should not be applied to auscultation or electronic fetal monitoring; they are imprecise and nonspecific, and have little positive predictive value. It is advised that FHR changes be recorded in a descriptive manner.***

Electronic Fetal Monitoring

1. **Paper Speed**
   It is suggested that each institution run their monitors ordinarily at one paper speed to facilitate pattern recognition. We are most familiar with 3 cm/min and suggest 3 cm/minute.

2. **Recording the Findings**
   In documentation of fetal heart rate monitoring, describe the event being observed eg. baseline heart rate, presence or absence of variability, presence or absence of accelerations or decelerations. Avoid conclusions like "normal", "abnormal", or "possible asphyxia".