The following guidelines are intended only as a general educational resource for hospitals and clinicians, and are not intended to reflect or establish a standard of care or to replace individual clinician judgment and medical decision making for specific healthcare environments and patient situations.

Guideline for Fetal Monitoring in Labor and Delivery

December 2012

Fetal heart rate patterns may indicate fetal well-being as well as the status of fetal oxygenation. Consistent employment of monitoring techniques and terminology may lead to more accurate interpretation of fetal heart rate patterns.

Unit Structure

Hospital units should develop methods of ensuring competency of perinatal staff and obstetrical care providers in fetal heart rate (FHR) monitoring and interpretation using the same educational tool/methodology across disciplines (1) (Level C). Suggested methods for accomplishing this goal include the following:

- Periodic educational courses
- FHR strip review conferences
- Chart reviews for documentation of FHR interpretation
- Certification programs/successful completion of a formal education program (uniform & verifiable)

All units should develop guidelines that describe a common language of FHR interpretation as well as methods of responding to abnormal FHR patterns. NNEPQIN recommends employing the National Institute of Child Health & Human Development (NICHD) standardized guidelines for interpretation of the fetal heart rate. (Appendix 2)

Obstetrical units should develop a procedure for archiving the fetal monitoring tracings within their own institution.

Definitions

Refer to Appendix 1 for NICHD standardized terminology for FHR interpretation.

Uterine Tachysystole: more than 5 contractions in 10 minutes, averaged over a 30-minute window.

Indications for FHR Monitoring in Labor and Delivery

All patients presenting to Labor and Delivery units at viability should undergo an initial period of electronic fetal monitoring for a minimum of 20 minutes or until fetal well being is assured. Monitoring for longer periods should be performed depending on the clinical circumstances. Pregnancies that are considered previable should have the fetal heart rate determined and further monitoring if appropriate (2) (Level C).

Patients presenting in labor should have monitoring either periodically or continuously. In general, intermittent FHR monitoring with auscultation is associated with similar rates of perinatal mortality and cerebral palsy as compared with electronic fetal monitoring (EFM) (2) (Level B). EFM may be associated with higher rates of operative vaginal delivery and cesarean delivery compared to intermittent auscultation (3) (Level B). Most studies comparing the outcomes of intermittent auscultation and EFM did not include pregnancies with maternal or fetal complications.

Continuous electronic fetal monitoring should be considered in active labor when risk factors are present (NNEPQIN recommendation.) Below is a list of conditions that may be considered high risk and for which continuous EFM may be considered:

Maternal Conditions

- Anitphospholipid Antibody Syndrome
- Hyperthyroidism (poorly controlled)
- Hemoglobinopathies (Hemoglobin SS, SC or S-Thalassemia)
- Complex cardiac disease
- Symptomatic Lupus Erythematosus
- Chronic Renal Disease
- Hypertensive disorders

Diabetes requiring medical therapy

Pregnancy Related Conditions

- Oligohydramnios
- Polyhydramnios
- Intrauterine Growth Restriction
- Preterm (<35 weeks) or Postterm Pregnancy (over 42 weeks)
- Isoimmunization (moderate to severe)
- Multiple gestation
- Pre Eclampsia
- Oxytocin induction or augmentation
- Chorioamnionitis
- VBAC
- Epidural

Equipment for Fetal Monitoring

Auscultation of FHR: Either a fetoscope or externally applied doppler device may be used.

Electronic Fetal Heart Rate Monitor:

- External ultrasound doppler compatible with the electronic fetal monitor
- Internal spiral electrode that is compatible with the electronic fetal monitor
    - Internal monitoring should be employed when the externally derived tracing is difficult to interpret because of poor technical quality (4) (Level C).

Maternal Pulse Monitor:

- Electronic monitor capable of monitoring maternal heart rate for comparison to FHR
    - Maternal heart rate monitoring is indicated when the FHR pattern is uncertain or similar to maternal heart rate, which may suggest that the equipment intended to determine the fetal heart rate may instead be detecting the maternal heart rate. This could be determined by synchronous FHR and maternal pulse monitoring using the maternal pulse oximetry on the fetal heart rate monitor (4) (Level C).

Uterine Contraction Monitor:

- External tocodynamometry (toco) to assess frequency and duration of contractions Intensity is subjectively evaluated by palpation as mild, moderate, or strong.
    - Resting tone is assessed by palpation and the uterus should be soft.
- Intrauterine pressure catheter (IUPC) provides a direct measurement of the intrauterine pressure in mmHg, as well as the frequency and duration of contractions.
    - IUPC readings should be verified using uterine palpation as needed.
        Acceptable Range
            Mild: 15-30 mmHg above resting tone
            Moderate: 30-50 mmHg above resting tone
            Strong: 50-75 mmHg above resting tone
    - Normal resting tone: 5-15 mmHg
    - Indications: Internal uterine monitoring does not reduce the rate of cesarean section or improve neonatal outcomes (5) (Level A). In general, since external monitoring is less invasive and of lower risk, external monitoring should be employed. Possible indications for IUPC monitoring include: (6, 7) (Level C)
        - When external methods do not provide accurate monitoring, such as in the case of maternal obesity or frequent changing of maternal position.
        - To improve the interpretation of the timing of fetal heart rate decelarations in relation to uterine contractions.
        - In the absence of one-on-one nursing.
        - To determine the strength of contractions in cases of suspected labor dystocia or during labor induction or augmentation.
        - To perform amnioinfusion.

Special Considerations

In cases of multiple gestation, a monitor capable of simultaneously recording more than one fetal heart rate should be used. Abdominal palpation or ultrasound may be necessary for location of the placement of monitors, or to ensure that each fetus is simultaneously monitored. Label tracings with the identification of each fetus. An internal scalp electrode may facilitate monitoring, once membranes are ruptured.

In cases of intrauterine fetal demise, no monitoring or uterine monitoring only may be appropriate.

PROCEDURE:

Notification of obstetrical care providers should be consistent with the **EFM Algorithm** (Appendix 4) in all fetal monitoring situations.

Non Stress Testing

- Interpretation (2)
    - Reactive FHR Tracing:
        - Baseline FHR of 110-160 beats per minute (bpm),
          AND
        - No FHR decelerations
          AND
        - Two FHR accelerations (to a peak of at least 15 bpm and lasting at least 15 seconds) within 20 minutes
            - If less than 32 weeks gestation: criteria include 2 accelerations of 10 bpm or more, each lasting at least 10 seconds within 20 minutes
    - Nonreactive: Does not meet reactive criteria
- All patient assessments and interventions should be documented.
- Identification of a Category II or III Pattern (Appendix 3) will result in
    - Initiation and documentation of nursing interventions based on pattern identified.
    - Documentation of the FHR and uterine activity response to interventions.
    - Consultation with obstetrical care provider (when appropriate) and appropriate documentation.

Fetal Monitoring in Active Labor

- Auscultation (8, 9) (Level B)
    - 1:1 nursing should be employed when auscultation is used for FHR monitoring.
    - Assess the FHR before, during, and for at least 30 – 60 seconds following a contraction.
    - Maternal heart rate should be assessed every 30 minutes in conjunction with FHR auscultation

    - Assess and document the rate and presence of accelerations and/or decelerations at the following intervals:
        - In the absence of risk factors:
            - Every 15-30 minutes during the active phase of labor
            - Every 5-15 minutes during the (active pushing phase) of the second stage of labor
            - The maternal-fetal condition, patient preference, unit resources and policy should be taken into consideration when auscultation intervals are determined.
        - With risk factors present: continuous EFM is recommended
    - If one deceleration is present during auscultation, auscultation should be employed again with the next contraction, or within 5 minutes. If a deceleration is present again, continuous EFM should be initiated.
    - If auscultation reveals fetal bradycardia, tachycardia, or FHR decelerations, or there is an inability to accurately assess the FHR with intermittent auscultation, continuous EFM should be initiated.
- Continuous Electronic Monitoring
    - Review and evaluate the FHR tracing at the following intervals: (8, 9) (Level B)
        - In the absence of risk factors:
            - Every 30 minutes during the active phase of labor
            - Every 15 minutes during the (active pushing phase) of the second stage of labor
        - With risk factors present:
            - Every 15 minutes during the active phase of labor
            - Every 5 minutes during the second stage of labor
    - The Registered Nurse caring for a patient on continuous monitoring will document the FHR interpretation every 30 minutes during the active phase of labor and every 15 minutes during the second stage of labor (9) (Level C).
- Identification of a Category II or III Pattern (Appendix 3) will result in
    - Initiation and documentation of nursing interventions based on pattern identified.
    - Documentation of the FHR and uterine activity response to interventions.
    - Consultation with obstetrical care provider (when appropriate) and appropriate documentation

Uterine Activity Assessment

- Uterine activity should be documented at the same time as documentation of the FHR interpretation. Uterine activity documentation should include: frequency, duration and intensity of contractions as well as presence or absence of uterine resting tone. (10) (Level C) A toco should be considered whenever FHR decelerations are present or there is concern about abnormal labor progress.
- Uterine tachysystole should always be qualified as to the presence or absence of associated FHR decelerations. If more than 5 contractions are present in 10 minutes, interventions may be initiated before the 30-minute window has occurred. Refer to the "NNEPQIN Guideline for the Use of Oxytocin" for a tachysystole algorithm.

Initial Management of Category-Defined FHR patterns (see EFM Algorithm, Appendix 4)
Once the FHR pattern is determined (Appendix 3), initial management may include the following: (11, 12, 13, 14, 15)

- Category I patterns are considered normal, and are usually associated with normal fetal acid-base status. In general, the labor management plan can be continued with monitoring as determined appropriate for the maternal-fetal condition (Level A).
- Category III patterns are considered abnormal, and are associated with possible decreased fetal oxygenation and/or fetal acidemia. Resuscitative measures should be employed and if the pattern does not resolve, prompt delivery is required (Level A).
    - Discontinue Pitocin
    - Consult OB and Anesthesia care provider
    - Reposition patient
    - IV bolus
    - Administer 10 L oxygen via non-rebreather mask
    - Prepare operating room
    - Update Pediatrics/NICU
    - Explain assessments and interventions to patient
    - Provide support for the family
- Category II patterns include all patterns not described in the definitions of Category I or Category III patterns. Category II patterns include many different types of FHR patterns and the significance of these may be indeterminate. In general, when fetal heart rate accelerations are present or can be elicited, or when the fetal heart rate variability is moderate, fetal acid-base status is likely normal. This can help guide initial clinical management. Category II patterns require evaluation, and initial interventions may be necessary. Continued close observation is often necessary (Level B).
- **Category II:**
    - Minimal variability after narcotic administration, within the expected period of therapeutic effect
        - Continue care
        - Reevaluate per guideline
        - Reassure Patient
- **Category II (any of the following):**
    - Minimal variability not accompanied by decelerations
    - Marked variability not accompanied by decelerations
    - Tachycardia
    - Recurrent late or variable decelerations, accompanied by moderate baseline variability
        - Consult OB Care Provider
        - Possible Interventions:
            - Reduce or discontinue Pitocin
            - If tachysystole is present, turn Pitocin off immediately
            - Reposition patient
            - Administer 10L oxygen via non-rebreather mask
            - IV bolus
            - Explain assessment and make plan of care with patient

- **<u>Category II (any of the following):</u>**
    - Bradycardia not accompanied by absent variability
    - Absent baseline variability not accompanied by recurrent decelerations
    - Absence of induced accelerations after fetal stimulation
    - Recurrent late or variable decelerations, accompanied by minimal baseline variability
    - Prolonged deceleration (greater than 2 minutes, but less than 10 minutes.)
        - Turn Pitocin off immediately
        - Consult OB care Provider
        - Other Possible Interventions:
            - Reposition patient
            - Administer 10L oxygen via non-rebreather mask
            - IV bolus
        - Explain assessment and make plan of care with patient

PROPOSED PERFORMANCE MEASURE: The frequency of correct use of NICHD terminology when documenting abnormal fetal heart rate patterns in the medical record.

Appendix Items:

1. **USPSTF criteria for evaluation of scientific evidence**
2. **NICHD definitions for EFM terminology**
3. **Three Tiered Fetal Heart Rate Interpretation System**
4. **NNEPQIN EFM Algorithm**

Appendix 1

Studies were reviewed and evaluated for quality according to the method outlined by the U.S. Preventative Services Task Force

I Evidence obtained from at least one properly designed randomized controlled trial.

II–1 Evidence obtained from well–designed controlled trials without randomization.

II–2 Evidence obtained from well–designed cohort or case–control analytic studies, preferably from more than one center or research group.

II–3 Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments also could be regarded as this type of evidence.

III Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

Based on the highest level of evidence found in the data, recommendations are provided and graded according to the following categories:

Level A—Recommendations are based on good and consistent scientific evidence.

Level B—Recommendations are based on limited or inconsistent scientific evidence.

Level C—Recommendations are based primarily on consensus and expert opinion.

Appendix 2

NICHD definitions for EFM Terminology

Term	Definition

Baseline	• The mean FHR rounded to increments of 5 beats per minute during a 10-minute segment, excluding:
	  • Periodic or episodic changes
	  • Periods of marked FHR variability
	  • Segments of baseline that differ by more than 25 beats per minute
	• The baseline must be for a minimum of 2 minutes in any 10-minute segment, or the baseline for that time period is indeterminate. In this case, one may refer to the prior 10-minute window for determination of baseline.
	• Normal FHR baseline: 110–160 beats per minute
	• Tachycardia: FHR baseline is greater than 160 beats per minute
	• Bradycardia: FHR baseline is less than 110 beats per minute

Baseline variability	• Fluctuations in the baseline FHR that are irregular in amplitude and frequency
	• Variability is visually quantitated as the amplitude of peak-to-trough in beats per minute.
	  • Absent—amplitude range undetectable
	  • Minimal—amplitude range detectable but 5 beats per minute or fewer
	  • Moderate (normal)—amplitude range 6–25 beats per minute
	  • Marked—amplitude range greater than 25 beats per minute

Acceleration	• A visually apparent abrupt increase (onset to peak in less than 30 seconds) in the FHR • At 32 weeks of gestation and beyond, acceleration has a peak of 15 beats per minute or more above baseline, with duration of 15 seconds or more but less than 2 minutes from onset to return. • Before 32 weeks of gestation, an acceleration has a peak of 10 beats per minute or more above baseline, with a duration of 10 seconds or more but less than 2 minutes from onset to return. • Prolonged acceleration lasts 2 minutes or more but less than 10 minutes in duration. • If an acceleration lasts 10 minutes or longer, it is a baseline change.
Early deceleration	• Visually apparent usually symmetrical gradual decrease and return of the FHR associated with a uterine contraction • A gradual FHR decrease is defined as from the onset to the FHR nadir of 30 seconds or more. • The decrease in FHR is calculated from the onset to the nadir of the deceleration.

	• The nadir of the deceleration occurs at the same time as the peak of the contraction. • In most cases the onset, nadir, and recovery of the deceleration are coincident with the beginning, peak, and ending of the contraction, respectively.
Late deceleration	• Visually apparent usually symmetrical gradual decrease and return of the FHR associated with a uterine contraction • A gradual FHR decrease is defined as from the onset to the FHR nadir of 30 seconds or more. • The decrease in FHR is calculated from the onset to the nadir of the deceleration. • The deceleration is delayed in timing, with the nadir of the deceleration occurring after the peak of the contraction. • In most cases, the onset, nadir, and recovery of the deceleration occur after the beginning, peak, and ending of the contraction, respectively.
Variable deceleration	• Visually apparent abrupt decrease in FHR • An abrupt FHR decrease is defined as from the onset of the deceleration to the beginning of the FHR nadir of less than 30 seconds. • The decrease in FHR is calculated from the onset to the nadir of the deceleration. • The decrease in FHR is 15 beats per minute or greater, lasting 15 seconds or greater, and less than 2 minutes in duration. • When variable decelerations are associated with uterine contractions, their onset, depth, and duration commonly vary with successive uterine contractions.
Prolonged deceleration	• Visually apparent decrease in the FHR below the baseline • Decrease in FHR from the baseline that is 15 beats per minute or more, lasting 2 minutes or more but less than 10 minutes in duration. • If a deceleration lasts 10 minutes or longer, it is a baseline change.
Sinusoidal pattern	• Visually apparent, smooth, sine wave-like undulating pattern in FHR baseline with a cycle frequency of 3–5 per minute which persists for 20 minutes or more.

Macones GA, Hankins GD, Spong CY, Hauth J, Moore T. The 2008 National Institute of Child Health and Human Development (NICHD) workshop report on electronic fetal monitoring: update on definitions, interpretation, and research guidelines. Obstet Gynecol 2008;112:661–6.

Appendix 3

Three-Tiered Fetal Heart Rate Interpretation System

Category I

- Category I FHR tracings include all of the following:
- Baseline rate: 110–160 beats per minute
- Baseline FHR variability: moderate
- Late or variable decelerations: absent
- Early decelerations: present or absent
- Accelerations: present or absent

Category II

Category II FHR tracings includes all FHR tracings not categorized as Category I or Category III. Category II tracings may represent an appreciable fraction of those encountered in clinical care. Examples of Category II FHR tracings include any of the following:

Baseline rate

- Bradycardia not accompanied by absent baseline variability
- Tachycardia

Baseline FHR variability

- Minimal baseline variability
- Absent baseline variability with no recurrent decelerations
- Marked baseline variability

Accelerations

- Absence of induced accelerations after fetal stimulation

Periodic or episodic decelerations

- Recurrent variable decelerations accompanied by minimal or moderate baseline variability
- Prolonged deceleration more than 2 minutes but less than10 minutes
- Recurrent late decelerations with moderate baseline variability
- Variable decelerations with other characteristics such as slow return to baseline, overshoots, or "shoulders"

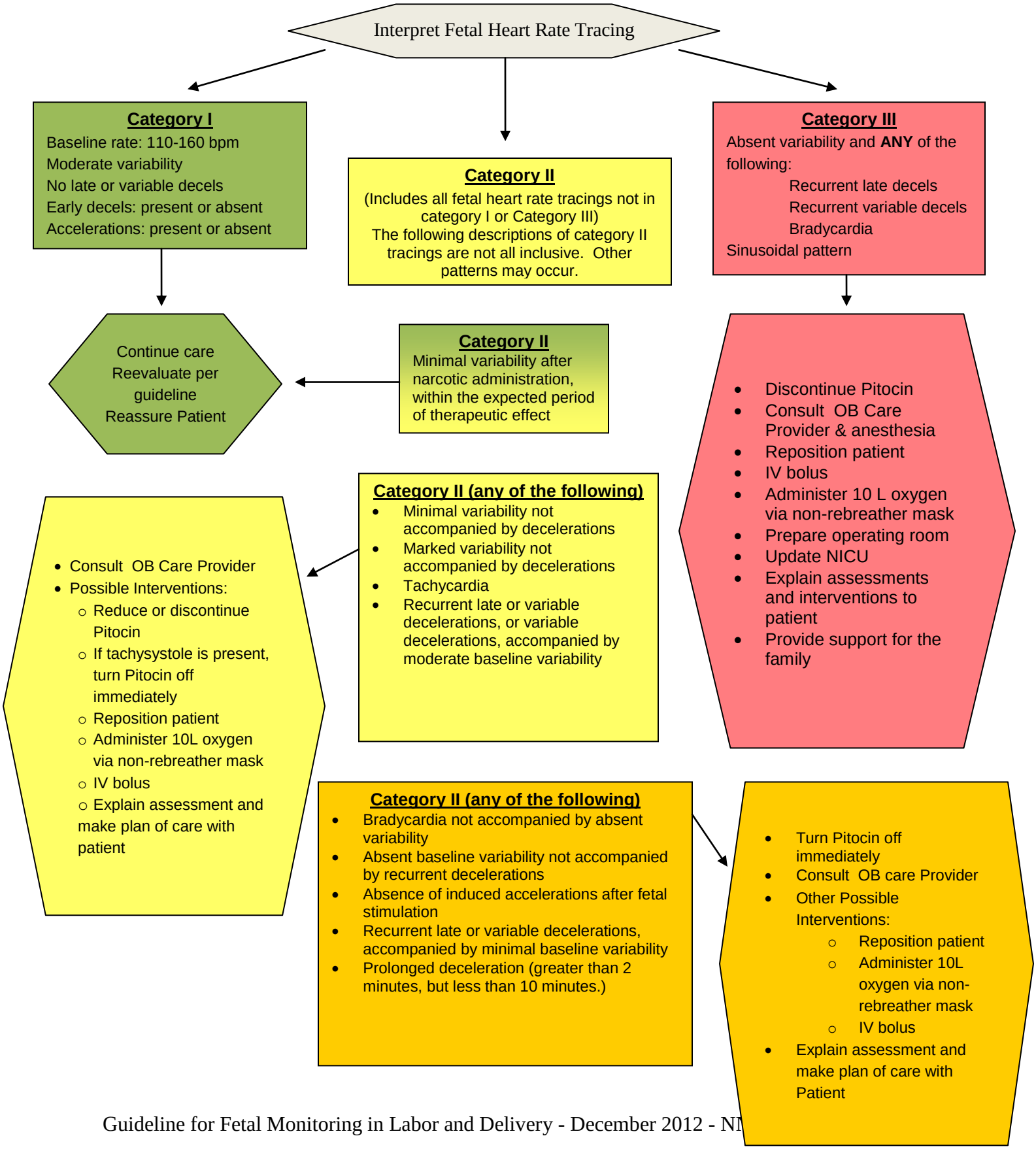
Category III

Category III FHR tracings include either

- Absent baseline FHR variability and any of the following:
  —Recurrent late decelerations
  —Recurrent variable decelerations
  —Bradycardia
- Sinusoidal pattern

Macones GA, Hankins GD, Spong CY, Hauth J, Moore T. The 2008 National Institute of Child Health and Human Development (NICHD) workshop report on electronic fetal monitoring: update on definitions, interpretation, and research guidelines. Obstet Gynecol 2008;112:661–6.

Appendix 4 NNEPQIN Algorithm for Electronic Fetal Heart Rate Assessment and Initial Intervention



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