Perinatal Webinar: EFM Update

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Disclosure:

“Please note that this Power Point presentation is an educational tool that is general in nature. It is not intended to be an exhaustive review of the subject matter or the opinion of Palmetto Health. Materials presented in this presentation should not be considered a substitute for actual statutory or regulatory language. Always refer to your legal counsel and the current edition of a referenced statute, code and/or regulation for precise language.”
Objectives

• Purpose and Goal:
  – Participants will be able to describe new updates related to evaluation of Electronic Fetal Monitoring including appropriate physiology and interventions.

• Continuing Education Objectives:
  – At the conclusion of this program, the participant should be able to:
    • discuss current terminology related to Electronic Fetal Monitoring.
    • understand current trends in category 2 management for Electronic Fetal monitoring

Discuss current terminology related to Electronic Fetal Monitoring.

• Review of terminology
• What are the issues with current terminology
Fetal Oxygenation / Placental Function

- [http://utilis.net/fhm/2463.htm](http://utilis.net/fhm/2463.htm)
- [http://utilis.net/fhm/2567.htm](http://utilis.net/fhm/2567.htm)

EFM History

- “In 1958, Hon published the first set of data on 80 women who underwent successful electronic recording of ‘instantaneous fetal heart rate throughout labor and delivery.’“

Hon’s First Article – EFM introduced....

What do we know about Electronic Fetal Monitoring?

- “There is a complex interplay of antepartum complications, suboptimal uterine perfusion, placental dysfunction, and intrapartum events can result in adverse neonatal outcome. ... The fetal brain modulate the fetal heart rate through an interplay of sympathetic and parasympathetic forces. Thus, fetal heart rate monitoring can be used to determine if a fetus is well oxygenated.”

What’s the Point of EFM?

• “Intrapartum EFM is intended to assess the adequacy of fetal oxygenation during labor. Fetal oxygenation involves the transfer of oxygen from the environment to the fetus and the fetal physiologic response if oxygen transfer is interrupted.”

To improve interpretation:

• Strong foundation:
  – NICHD Terminology
  – Understanding of Maternal-Fetal physiology
  – Appropriate and timely interventions
NICHD Terminology

• Do you know your EFM Terminology?

<table>
<thead>
<tr>
<th>TABLE 1 Standardized FHR definitions</th>
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<tbody>
<tr>
<td>Pattern</td>
</tr>
<tr>
<td>Baseline</td>
</tr>
<tr>
<td>Tachycardia</td>
</tr>
<tr>
<td>Bradycardia</td>
</tr>
<tr>
<td>Baseline variability</td>
</tr>
<tr>
<td>Absent</td>
</tr>
<tr>
<td>Minimal</td>
</tr>
<tr>
<td>Moderate</td>
</tr>
<tr>
<td>Marked</td>
</tr>
<tr>
<td>No distinction is made between short term variability (or beat-to-beat variability) or R-R wave period differences in the electrocardiogram and long-term variability because in actual practice they are usually determined as a unit.</td>
</tr>
<tr>
<td>Acceleration</td>
</tr>
<tr>
<td>Early deceleration</td>
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<tr>
<td>Late deceleration</td>
</tr>
<tr>
<td>Varietal deceleration</td>
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<tr>
<td>Prolonged deceleration</td>
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<tr>
<td>Periodic deceleration</td>
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<tr>
<td>Episodic deceleration</td>
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<tr>
<td>Sinusoidal pattern</td>
</tr>
</tbody>
</table>

FHR, fetal heart rate. Adapted from MacDonald et al. 1,2 Miller, Electronic fetal monitoring. J Matern Fetal Neonatal Med. 2012.
Category I: Normal
- Predictive of a normal fetal acid-base status at the time of observation
- No specific action required

Category II: Indeterminate
- Not predictive of abnormal fetal acid-base status, but no evidence to characterize as Category I or Category III
- Need evaluation, continued surveillance and reevaluation
- Must take into account the entire clinical picture

Category III: Abnormal
- Predictive of abnormal fetal acid-base status at the time of observation.
- Require prompt evaluation and efforts to resolve the FHR pattern
- For example: Maternal O2, change maternal position, D/C labor stimulation, Tx of maternal hypotension

NICHID, 2008
In reviewing the basics of EFM, have we uncovered some issues?

- Accuracy and efficacy of utilizing EFM in intrapartum and antepartum patients?
- What does all of this mean? How do we determine what to do?
- Anything else?
  - Management of Strips?
Understand Current Trends in Category 2 Management for Electronic Fetal Monitoring

- Management algorithms
- Goals of interventions
- Ensuring oxygenation of the fetus

**Question:**

- What are the main goals of Electronic Fetal Monitoring?
  1. Record fetal heart rate and uterine activity
  2. Indicate normal and abnormal uterine activity
  3. Indicate signs of fetal hypoxia
  4. Attempt to prevent poor birth outcomes and prevention of Cerebral Palsy (CP)

So, that leads us directly to another question, “How well do we do these things?”
What are common results of EFM Intrapartum and Antepartum Period

• Increase Operative Vaginal Delivery
• Increased Cesarean Delivery


Prediction of Acidemia

- Can we make predictions of fetal acidemia?
  - What tells us signs of Acidemia or Hypoxia in the Fetus?
    - Recall Categories
      - Category 1: “Normal”
      - Category 2: “Indeterminate”
      - Category 3: “Abnormal”
  - Study looked at ways to improve prediction of fetal compromise

Figure 1. Management algorithm of intrapartum fetal heart rate (FHR) tracing based on three-tiered category system. Abbreviation: FHR, fetal heart rate.

Figure 2. Management algorithm for uterine tachysystole. Abbreviation: FHR, fetal heart rate.
**Table 2. Various Intrauterine Resuscitative Measures for Category II or Category III Tracings or Both**

<table>
<thead>
<tr>
<th>Goal</th>
<th>Associated Fetal Heart Rate Abnormality*</th>
<th>Potential Intervention(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promote fetal oxygenation and improve uteroplacental blood flow</td>
<td>Recurrent late decelerations</td>
<td>Initiate lateral positioning (either left or right)</td>
</tr>
<tr>
<td></td>
<td>Prolonged decelerations or bradycardia</td>
<td>Administer maternal oxygen administration</td>
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<td></td>
<td>Minimal or absent fetal heart rate variability</td>
<td>Administer intravenous fluid bolus</td>
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<tr>
<td>Reduce uterine activity</td>
<td>Tachysystole with Category II or III tracing</td>
<td>Discontinue oxytocin or cervical ripening agents</td>
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<tr>
<td></td>
<td></td>
<td>Administer tocolytic medication (e.g., terbutaline)</td>
</tr>
<tr>
<td>Alleviate umbilical cord compression</td>
<td>Recurrent variable decelerations</td>
<td>Initiate maternal repositioning</td>
</tr>
<tr>
<td></td>
<td>Prolonged decelerations or bradycardia</td>
<td>Initiate maternal amnioinfusion</td>
</tr>
</tbody>
</table>

*Evaluation for the underlying suspected cause(s) is also an important step in management of abnormal FHR tracings. Depending on the suspected underlying cause(s) of FHR abnormality, combining multiple interventions simultaneously may be appropriate and potentially more effective than doing individually or serially (Cimpanier RI, James DC. Efficacy of intrapartum resuscitation techniques in improving fetal oxygen status during labor. Obstet Gynecol 2005;106:1-8).


**ACOG Practice Bulletin Number 116, November 2010**
Standardized Approach Continued: When to Deliver?

Await Spontaneous Delivery

Expedite Delivery

Delivery

Electronic fetal heart rate monitoring: applying principles of patient safety
David A. Miller, MD; Lisa A. Miller, CNM, JD. American Journal of Obstetrics & Gynecology APRIL 2012

Electronic Fetal Monitoring

• Strength
  – Ability to predict the absence of metabolic acidemia and hypoxic neurologic injury with an extremely high degree of reliability.

• Weakness
  – Inability to predict the presence of these conditions with any clinically relevant accuracy.

Electronic fetal heart rate monitoring: applying principles of patient safety
David A. Miller, MD; Lisa A. Miller, CNM, JD. American Journal of Obstetrics & Gynecology APRIL 2012
Can we Determine Fetal Asphyxia?

What is Fetal Asphyxia?

<table>
<thead>
<tr>
<th>TABLE 1: Definitions and Implications of Physiologic Terms Relevant to Hypoxic-Ischemic Encephalopathy</th>
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<tbody>
<tr>
<td>Physiologic Term</td>
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<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>Hypoxia</td>
</tr>
<tr>
<td>Hypoxemia</td>
</tr>
<tr>
<td>Hypoxemia-ischemia</td>
</tr>
<tr>
<td>Metabolic acidosis</td>
</tr>
<tr>
<td>Respiratory acidosis</td>
</tr>
<tr>
<td>Mixed acidosis</td>
</tr>
</tbody>
</table>

Aphasia: Marked impairment of gas exchange leading, if prolonged, to progressive hypoxemia, hypoxia, and significant metabolic acidosis. The term asphyxia, which describes a process of varying severity and duration rather than an end point, should not be applied to birth events unless specific evidence of markedly impaired intrapartum or immediate postnatal ips.


FIG. 1-1. Prenatal and perinatal causal pathways to cerebral palsy in term infants. Distal risk factors exert a pathogenic effect on fetal brain development starting at a time that is remote from the onset of irreversible brain injury. Examples include genetic abnormalities, environmental and sociodemographic factors, and some placental abnormalities. Proximal risk factors exert pathogenic effects on fetal brain development at a time that closely predates or coincides with the onset of irreversible brain injury. Examples include abruptio placentae, chorioamnionitis, and birth trauma. These are multiple potential causal pathways that lead to cerebral palsy in term infants, and the signs and symptoms of neonatal encephalopathy may range from mild to severe, depending on the nature and timing of the brain injury. A. Intrapartum brain injury that is due to a proximal risk factor may lead to neonatal encephalopathy and subsequent cerebral palsy. B. Intrapartum brain injury may be the result of both distal and proximal risk factors that predispose the fetus to brain injury and cerebral palsy. C. Brain injury or anoxia may occur in the intrapartum period as a result of distal and proximal risk factors. When brain injury or anoxia occurs at a time that is remote from the delivery process, neonatal encephalopathy may or may not be seen after birth. D. Brain injury may occur at multiple points during gestation. E. Proximal risk factor and brain injury may occur in the neonatal period following predisposing distal risk factors. Abbreviations: DRF: distal risk factor; PRF: proximal risk factor. (Note: Fig. 1-1 also appears in Chapter 13 as Fig. 13.1.)

DRF: Distal risk factor
PRF: Proximal Risk factor
NE: Neonatal Encephalopathy
CP: Cerebral Palsy
Can we Determine Fetal Oxygenation Better?

• What has been tried?
  – Fetal Blood sample
  – Fetal ECG Analysis
    • ST segment changes


What does ACOG say?

• Abnormal fetal surveillance is based on physiologic changes that alter fetal heart rate and fetal activity.
  – Fetal heart rate, fetal movement, and tone in particular are impacted by uteroplacental fetal blood flow alterations and are thereby sensitive to fetal hypoxemia and acidemia.

Image from: http://utilis.net/fhm/2418.htm

Expert Interpretations

- Specific Issues:
  - Lack of agreement in interpretation
  - Role of EFM in rising C-Section Rate
  - Litigation


New Thoughts on Category 2 Strips

- Suggestion to “start over” with respect to EFM
  - Language
  - Interpretation
  - Management

- “The management of category 2 FHR patterns remains the most important and challenging issue in the field of FHR monitoring, and is arguably 2nd only to preterm birth as the most pressing issue in clinical obstetrics.”


Image from: http://www.cliparthut.com
Management of Category 2

Category 2 Tracing

Assessment of Variability and Acceleration

Rule Out Presence of Clinically Significant Metabolic Acidemia

Acidemic Fetus

Uncertain

Assess the likelihood of developing significant acidemia prior to delivery

Move toward Delivery

If cannot exclude metabolic acidemia → expeditious delivery


Intrapartum Management Issues

Algorithm for management of category II fetal heart rate tracings

Moderate variability or accelerations

- Significant decelerations with ≥50% of contractions for 1 hour
- Significant decelerations with ≥50% of contractions for 30 minutes

Latent Phase

- Active Phase
- Second Stage

Observe

Cesarean or CVD

Observe

Cesarean or CVD

Manage per algorithm

Clark, Category II FHR, Aug 1 Obstet Gynecol 2013
Management of category II fetal heart rate patterns: clarifications for use in algorithm

1. Variability refers to predominant baseline FHR pattern (marked, moderate, minimal, absent) during a 30-minute evaluation period, as defined by NICHD.
2. Marked variability is considered same as moderate variability for purposes of this algorithm.
3. Significant decelerations are defined as any of the following:
   - Variable decelerations lasting longer than 60 seconds and reaching a nadir more than 60 bpm below baseline.
   - Variable decelerations lasting longer than 60 seconds and reaching a nadir less than 60 bpm regardless of the baseline.
   - Any late decelerations of any depth.
   - Any prolonged deceleration, as defined by the NICHD. Due to the broad heterogeneity inherent in this definition, identification of a prolonged deceleration should prompt discontinuation of the algorithm until the deceleration is resolved.
4. Application of algorithm may be initially delayed for up to 30 minutes while attempts are made to alleviate category II pattern with conservative therapeutic interventions (e.g., correction of hypotension, position change, amniocentesis, tocolysis, reduction or discontinuation of oxytocin).
5. Once a category II FHR pattern is identified, FHR is evaluated and algorithm applied every 30 minutes.
6. Any significant change in FHR parameters should result in re-evaluation of algorithm.
7. For category II FHR patterns in which algorithm suggests delivery is indicated, such delivery should ideally be initiated within 30 minutes of decision for cesarean.
8. If at any time tracing reverts to category I status, or deteriorates for even a short time to category III status, the algorithm no longer applies. However, algorithm should be reinitiated if category I pattern again reverts to category II.
9. In fetus with extreme prematurity, neither significance of certain FHR patterns of concern in more mature fetus (e.g., minimal variability or ability of such fetuses to tolerate intrapartum events leading to certain types of category II patterns are well defined. This algorithm is not intended as guide to management of fetus with extreme prematurity.
10. Algorithm may be overridden at any time if, after evaluation of patient, physician believes it is in best interest of the fetus to intervene sooner.

FHR; fetal heart rate; NICHD, National Institute of Child Health and Human Development;
Does your personal experience, professional experience, clinical practice patterns or psychological factors affect your response to FHR?

What were the findings?

Intervention for Fetal Distress Among Obstetricians, Registered Nurses, and Residents

Similarities, Differences, and Determining Factors

Giuseppe Chiossi, MD. Intervention for Fetal Distress Among Obstetricians, Registered Nurses, and Residents Similarities, Differences, and Determining Factors

OBJECTIVE: To explore the factors possibly associated with the intrapartum management of non reassuring fetal status and the factors affecting the decision to expedite delivery for fetal distress among different obstetric health care providers.

METHODS: In a cross-sectional study, a standardized hypothetical clinical scenario of management of fetal distress was presented by a study investigator to labor and delivery personnel, including faculty obstetricians, residents, and registered nurses (N=59). An intervention index was calculated for each faculty by dividing the number of cesarean and operative deliveries for nonreassuring fetal status by the actual number of laboring patients supervised by each faculty in 2008.

Giuseppe Chiossi, MD. Intervention for Fetal Distress Among Obstetricians, Registered Nurses, and Residents Similarities, Differences, and Determining Factors
Does Your Personal Perspective Affect Timing of Interventions in the Intrapartum?

“Results of this study indicate that different providers may develop a uniform approach to fetal distress when they practice in the same environment and follow the available electronic fetal heart rate monitoring guidelines, overcoming the effects of different personal experiences, professional background, clinical practice, and psychological traits.”

Study Findings:

- The time of delivery and the specific fetal heart rate features indicative of fetal distress did not differ among the respondents
- Ideal Delivery Route vacuum assisted versus cesarean
- Registered nurses notified obstetricians about their concern for the fetal status earlier than residents
- NO effect on delivery:
  - Sociodemographic factors
  - Previous negative professional experiences
  - Perception of the respondents’ labor and delivery skills
  - Health care professionals’ age, number of years of practice, and percentage of professional time spent working in labor and delivery
  - Number of complications from operative deliveries or shoulder dystocia encountered by the respondents or their colleagues and mentors
  - Specific characteristics of the different providers’ practice
  - Providers’ psychological backgrounds
  - Sociodemographic background, professional experience, health care profession, clinical practice, and personality traits
- Medical professionals considered gravidity, parity, and patients’ education relevant in the decision of how to expedite delivery in the second stage of labor

Giuseppe Chiossi, MD. Intervention for Fetal Distress Among Obstetricians, Registered Nurses, and Residents. Similarities, Differences, and Determining Factors. VOL. 118, NO. 4, OCTOBER 2011 OBSTETRICS & GYNECOLOGY

Nursing Documentation

- “A fundamental principle of nursing documentation is that nursing notes and entries must provide a comprehensive picture of patient care such that it will support the nurse’s answers to questions raised at deposition or trial, and this principle applies equally well to physician and midwifery documentation.”
- Simplification of documentation while maintaining and meeting all legal and professional requirements is crucial.

Lisa Miller, CNM, JD. Intrapartum Fetal Monitoring: Liability and Documentation. CLINICAL OBSTETRICS AND GYNECOLOGY Volume 54, Number 1, 50–55
Successful risk management in EFM requires a 2-pronged approach:

- Clinical strategies to reduce or avoid the occurrence of preventable adverse outcomes
- Evidence of clinicians’ awareness and attentiveness to fetal and maternal status during labor

**EFM Documentation**

- Standardization of EFM terminology, interpretation, and management
- Clinicians must be able to provide proof of competent care and timely and appropriate interventions.
- The frequency of documentation should be proportional to the acuity level of the individual patient
Questions?

- Because you are listening to an archived webinar, please forward all questions to the presenter at:
  michelle.flanagan@palmettohealth.org or PerinatalSystems@Palmettohealth.org

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