Fetal Heart Rate Monitoring
The Things That Trip Us Up

Michael Fox RN, BSN, Director

perinatal resource group
for Obstetric and neonatal care

1997
A Common Language

...we had to first agree on what we saw...and what we were going to call it.

Committee established neutrality of nomenclature. Emphasized FHR terminology was purely descriptive not diagnostic

“No assumptions are made of the etiology of the patterns or their relationship to hypoxemia or metabolic acidemia.”

Hierarchy of “Goodness and Badness”

Earlys

Variables

Invisible baggage-the background conversation that’s resisting change

Lates

Bradycardia
Why Is Ranking Information So Important?

- We are simply not skillful at considering multiple factors. We give some variables too much weight and ignore others.
- We ultimately make each decision using one principle predictor at a time. First cue used to evaluate tracing disproportionately impacts our evaluation of everything else that follows.
- Effective System FHR Interpretation should help direct providers to give each feature tracing it’s appropriate weight.

NICHD 2008
Three - Tier Fetal Heart Rate Interpretation System

Normal
Indeterminate
Abnormal
NICHD 2008

Category 1
- FHR 110-160 bpm
- Moderate Variability
- No late or variable decelerations
- ± earlys
- ± accelerations

Category III
Absent variability with:
- Recurrent Late decelerations
- Variable decelerations
- Bradycardia
- Sinusoidal pattern

NICHD: Category II Tracings

Not a homogenous group.
- Include FHR patterns with the full spectrum of variability
- Patterns with the full range of association or lack thereof with significant acidemia.
Categories aren’t useful for verbal communication without clearly describing the tracing.
Simplify and make clear the framework for how we interpret and manage FHR tracings.

Interpretive Framework Should Reduce Variation

• Clearly identify the relationship between FHR patterns and significant acidemia
• Clarify how our presumptive diagnosis informs the choice and timing of our interventions

2006 - Fetal acidemia and electronic fetal heart rate patterns: Is there evidence of an association?
J. T. Parer a; T. King a; S. Flanders a; M. Fox a; S. J. Kilpatrick b

4 Simple Guidelines FHR Monitoring

1. FHR decelerations as an independent finding are poorly predictive of complicated outcomes.
2. The degree of variability is the most sensitive indicator of the adequacy of oxygen delivery to the fetus at any given moment in time.
3. A metabolic acidosis typically develops slowly in association with recurrent decelerations and an evolutionary reduction of FHR variability over time.
4. The deeper the decelerations the > likelihood for developing a significant acidosis.
Moderate FHR Variability reliably predicts the absence of fetal metabolic acidemia at the time it is observed.

Minimal FHR Variability (in the absence of accelerations... that cannot be explained resolved with resuscitation) should be considered as potentially indicative of fetal acidemia and managed accordingly.

Category III tracing with Absent FHR Variability ... is abnormal and conveys an increased risk of fetal acidemia at the time it is observed.

Given the diverse spectrum of abnormal FHR patterns in Category II The presence of FHR accelerations or moderate FHR variability or both are highly predictive of normal fetal acid-base status and thus may help guide clinical management.
Minimal variability… should be considered as potentially indicative of fetal acidemia and should be managed accordingly.

Moderate FHR variability reliably predicts the absence of fetal metabolic acidemia at the time it is observed.

Absent variability with decelerations… is abnormal and conveys an increased risk of fetal acidemia at the time it is observed.

Core Interpretive Principles

Moderate FHR variability reliably predicts the absence of fetal metabolic acidemia at the time it is observed.

Minimal variability… should be considered as potentially indicative of fetal acidemia and should be managed accordingly.

Absent variability with decelerations… is abnormal and conveys an increased risk of fetal acidemia at the time it is observed.

Interpretive Principles

Significant Acidemia?

NO

Maybe

Presumed

Evolution of Significant Acidemia?

Clearly identify what the typical and observable changes in the FHR tracing associated with a increased likelihood for birth in the presence of a significant fetal acidemia?

1. Evolutionary loss of FHR variability
2. In association with recurrent decelerations and/or bradycardia
3. That get deeper over time

The opportunity then and now……

We have to make the obvious
• 98% of the fetuses with moderate FHR variability, with or without decelerations or second stage bradycardia will be born in the absence of a significant metabolic acidosis, and/or in the presence of neonatal vigor.

• When moderate FHR variability is present at the time of birth < 1% of neonates will be born with an Apgar score <7 at 5 minutes.
2nd stage prolonged deceleration/bradycardia

Category
1. I
2. II
3. III

Significant Acidemia
1. Yes
2. No
3. Maybe

Acute Hypoxia

Category
1. I
2. II
3. III

Significant Acidemia
1. Yes
2. No
3. Maybe
Category II tracings with continued minimal variability (in the absence of accelerations or normal scalp pH) that cannot be explained or resolved with resuscitation should be considered as potentially indicative of fetal acidemia and should be managed accordingly.
Evaluation of recurrent variable decelerations includes their frequency, depth and duration, uterine contraction pattern, FHR variability. Recurrent variable decelerations that progress to greater depth and longer duration are more indicative of impending fetal acidemia.
The presence of FHR accelerations (either spontaneous or stimulated) reliably predicts the absence of fetal metabolic acidemia. The absence of accelerations does not, however, reliably predict fetal acidemia.

NICHD 2008: On FHR Accelerations

Scalp Stimulation Test-No Periodic Changes

<table>
<thead>
<tr>
<th>Indications Sampling</th>
<th># fetuses</th>
<th># Scalp ph &lt; 7.20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal baseline</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>No periodic changes - “Diminished Variability”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal baseline rate</td>
<td>26</td>
<td>1</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>2</td>
</tr>
</tbody>
</table>

A Category III tracing (absent variability with either late or variable decelerations, bradycardia and sinusoidal pattern) is abnormal and conveys an increased risk of fetal acidemia at the time it is observed.

Making Care Safer - A Consistent Approach to FHR Tracing Evaluation Communication and Management

What Do We Need To Do Reduce Risk In Labor and Delivery

• Develop consistent, reliable processes for the things we can anticipate.
• Focus on improving our ability to respond to and manage the unexpected.

Michael Leonard
Use NICHD Terminology

Don’t Default to Diagnostic Non Standardized Terminology

A Common Goal
Accomplish delivery in the absence of significant acidemia defined as cord umbilical artery blood gas at the time of birth, Delivery in the a CUA gas $\geq 7.1$ $\geq -12$ mEq L$^{-1}$ and/or Apgar score $\geq 7$ at 5 minutes

A Three-Tier Fetal Heart Rate Interpretation System

4 Key Interpretive Guidelines

1. FHR Decelerations as an independent finding are poorly predictive of complicated outcomes.

2. The degree of variability is the most sensitive indicator of the adequacy of oxygen delivery to the fetus at any given moment in time.

3. A metabolic acidosis typically develops slowly in association with recurrent decelerations and an evolutionary reduction of FHR variability over time.

4. The deeper the decelerations the $>$ likelihood for developing a significant acidosis.
Variability

Evaluate Tracing
Ranked Order

Decelerations
Uterine activity
Baseline FHR

Evolution tracing over time

Evidence Based Indications For Action

Based on the degree of variability that accompanies the decelerations

Make a presumptive Diagnosis

Significant Acidosis?
YES?
NO?
MAYBE?

7 Key Collaborative Practice Guidelines

7 Key Collaborative Interventions
1. Observation
2. Notification
3. Bedside Evaluation
4. Preparation for Delivery
5. Delivery
6. Resuscitation
7. Transfer/Transport

Linked Collaborative Practice Guidelines
The Bottom Line

“We must have a system of fetal heart rate monitoring that makes it easy to do things right and hard to do them wrong.”

Adapted from IOM report 1999