Electronic Fetal Monitoring
Definitions, Interpretation and Management

Applying Principles of Patient Safety

David A. Miller, M.D.
Professor of Obstetrics, Gynecology and Pediatrics
Division of Maternal Fetal Medicine
University of Southern California Keck School of Medicine
Children's Hospital Los Angeles

FHR monitoring consists of three components:

- Intrapartum FHR Monitoring
  - Definition
  - Interpretation
  - Management

- Normal baseline rate 110-160 bpm
- Mean FHR rounded to increments of 5 bpm in a 10-minute window
Variability is defined as fluctuations in the baseline that are irregular in amplitude and frequency...

The fluctuations are measured from peak-to-trough in bpm.

No distinction is made between short-term (beat-to-beat) variability and long-term variability because in actual practice they are visually determined as a unit.

**Acceleration**

Abrupt increase (onset to peak < 30 sec) from baseline

32 weeks and beyond – 15 x 15

Before 32 weeks – 10 x 10

**Decelerations**

Early
Late
Variable
Prolonged
New “Three-Tier” System

Category I – “Normal”
Baseline rate: 110-160 bpm
Variability: Moderate
Decelerations: No late, variable or prolonged

New “Three-Tier” System

Category III – “Abnormal”
Absent variability with recurrent late decelerations
Absent variability with recurrent variable decelerations
Absent variability with bradycardia for at least 10 min
Sinusoidal pattern for at least 20 min
Category II?

Everything Else

Definitions:  Factual Accuracy
• Baseline
• Variability
• Accelerations
• Decelerations
• Changes or trends over time
• “CATEGORY”
Interpretation

Intrapartum FHR monitoring is intended to assess **fetal oxygenation**

Fetal oxygenation involves the transfer of oxygen from the environment to the fetus...
And the subsequent fetal physiologic response if oxygen transfer is interrupted...

What does the fetal heart rate tracing reveal about this pathway?

All FHR decelerations that have any potential clinical significance have the same common trigger...

Interruption of oxygen transfer from the environment to the fetus at one or more points along the oxygen pathway
Principle #1: Variable, late or prolonged decelerations signal interruption of the oxygen pathway at one or more points.

What information can the FHR tracing provide regarding the fetal response to interruption of the oxygen pathway?

The second half of the pathway.

The 2008 NICHD consensus statement identified two fetal heart rate characteristics that reliably predict the absence of fetal metabolic acidemia at the time they are observed.
Principle #2

Moderate variability and/or accelerations reliably predict the absence of fetal metabolic acidemia at the time they are observed.

What is the physiologic significance of excluding metabolic acidemia?
Metabolic acidemia is an essential prerequisite to intrapartum hypoxic neurologic injury.

Fetal Heart Rate Interpretation

Principle #1: Variable, late or prolonged decelerations signal interruption of the oxygen pathway at one or more points.

Principle #2: Moderate variability and/or accelerations reliably exclude fetal metabolic acidemia at the time they are observed.

Principle #3: Excluding metabolic acidemia excludes intrapartum fetal hypoxic neurologic injury.

Standardized management is the next challenge.
The objective of a “standardized management” protocol is to minimize the opportunities for preventable error.

Plan: 

**Factually accurate Articulate**

Intrapartum Fetal Heart Rate Management Decision Model

- Confirm FHR and uterine activity
- FHR Category?
  - Is the patient low-risk?
    - Routine Surveillance
      - Every 30 min in the 1st stage of labor
      - Every 15 min in the 2nd stage of labor
    - Heightened Surveillance
      - Every 15 min in the 1st stage of labor
      - Every 5 min in the 2nd stage of labor

- Heightened Surveillance
Intrapartum Fetal Heart Rate Management Decision Model

Confirm FHR and uterine activity

FHR Category:

II or III

Is the patient low-risk?

Routine Surveillance

• Every 30 min in the 1st stage of labor
• Every 15 min in the 2nd stage of labor

Heightened Surveillance

• Every 15 min in the 1st stage of labor
• Every 5 min in the 2nd stage of labor

**ABCD**

"A" – Assess oxygen pathway
"B" – Begin corrective measures

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<table>
<thead>
<tr>
<th><strong>A</strong></th>
<th><strong>B</strong></th>
<th><strong>C</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess Oxygen Pathway</td>
<td>Begin Corrective Measures if Indicated</td>
<td>\textbf{\textit{ABCD}}</td>
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</tbody>
</table>

**Lungs**
- Airway and breathing
  - Supplemental oxygen

**Heart**
- Heart rate and rhythm
  - Position change
  - Fluid bolus
  - Intravenous pressors
  - Oxygenation

**Position**
- Change position
- Breathing assistance
- Position change
- Intravenous pressors
- Oxygenation

**Vasculature**
- Blood pressure
- Volume status
- Uterus
  - Contraction strength
  - Frequency
  - Baseline uterine tone
  - Exclude uterine rupture
  - Stop or reduce stimulant
  - Consider uterine relaxant

**Placenta**
- Placental separation
- Bleeding
  - Vasa previa
- Umbilical cord
  - Vaginal exam
  - Exclude cord prolapse
  - Consider amnioinfusion
Is the patient low-risk?

"ABCD"

A – Assess the oxygen pathway
B – Begin corrective measures
C – Clear obstacles to rapid delivery

Standardized Intrapartum Management

Intrapartum Fetal Heart Rate Management Decision Model

- Confirm FHR and uterine activity
- FHR Category?
- II or III
- Is the patient low-risk?
- Routine Surveillance
- Heightened Surveillance
- Expedite Delivery

Presence of moderate variability or accelerations
Absence of clinically significant decelerations

FHR Category?
- II
- III

FHR Category?
- "ABCD"

Every 30 min in the 1st stage of labor
Every 15 min in the 2nd stage of labor

Every 15 min in the 1st stage of labor
Every 5 min in the 2nd stage of labor

Intrapartum Fetal Heart Rate Management Decision Model

Routine Surveillance
- Every 30 min in the 1st stage of labor
- Every 15 min in the 2nd stage of labor

Heightened Surveillance
- Every 15 min in the 1st stage of labor
- Every 5 min in the 2nd stage of labor

Expedite Delivery
Clear obstacles to rapid delivery

If conservative measures do not correct the FHR tracing, it is prudent to plan ahead for the possible need for rapid delivery

*This does NOT commit the patient to delivery*

It simply identifies common sources of unnecessary delay in a systematic way so they can be addressed in timely fashion

By doing this, it demonstrates reasonableness

An essential element of the standard of care

Consider individual characteristics of

- Facility
- Staff
- Mother
- Fetus
- Labor

<table>
<thead>
<tr>
<th>Action</th>
<th>Assess Oxygen Pathway</th>
<th>Begin Corrective Measures if Indicated</th>
<th>Clear Obstacles to Rapid Delivery</th>
<th>Determine Decision to Delivery Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>Anxiety and breathing</td>
<td>Supplemental oxygen</td>
<td>Facility</td>
<td>Facility response time</td>
</tr>
<tr>
<td>Stress</td>
<td>Heart rate and rhythm</td>
<td>Position changes</td>
<td>Staff</td>
<td>Staff response time</td>
</tr>
<tr>
<td>Contraction</td>
<td>Blood pressure</td>
<td>Blood pressure</td>
<td>Mother</td>
<td>Mother response time</td>
</tr>
<tr>
<td>Variables</td>
<td>Contracting strength, duration, frequency</td>
<td>Position changes</td>
<td>Fetus</td>
<td>Fetus response time</td>
</tr>
<tr>
<td>Airways</td>
<td>Respiratory rate</td>
<td>Respiratory rate</td>
<td>Labor</td>
<td>Labor response time</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>Blood pressure</td>
<td>Blood pressure</td>
<td>Consider amnioinfusion</td>
<td>Consider amnioinfusion</td>
</tr>
<tr>
<td>Fluids</td>
<td>Volume status</td>
<td>Volume status</td>
<td>Consider amnioinfusion and antenatal corticosteroids</td>
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</tr>
</tbody>
</table>
Is the patient low-risk?

"A" – Assess oxygen pathway
"B" – Begin corrective measures

"C" – Clear obstacles to rapid delivery
"D" – Determine decision to delivery time

FHR Category?

"II" or "III"

Routine Surveillance

Every 30 min in the 1st stage of labor
Every 15 min in the 2nd stage of labor

Heightened Surveillance

Every 15 min in the 1st stage of labor
Every 5 min in the 2nd stage of labor

Expedite Delivery

Is vaginal delivery likely before the onset of metabolic acidemia and potential injury?

Yes

Routine Surveillance

Every 30 min in the 1st stage of labor
Every 15 min in the 2nd stage of labor

Heightened Surveillance

Every 15 min in the 1st stage of labor
Every 5 min in the 2nd stage of labor

Expedite Delivery

"Deciding to wait"

Clinical judgment

"Waiting to decide"

Procrastination
<table>
<thead>
<tr>
<th><strong>A</strong></th>
<th><strong>B</strong></th>
<th><strong>C</strong></th>
<th><strong>D</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess Oxygen Pathway</td>
<td>Begin Corrective Measures If Indicated</td>
<td>Clear Obstacles to Rapid Delivery</td>
<td>Determine Decision to Deliver Baby</td>
</tr>
<tr>
<td>Lungs</td>
<td>Heart</td>
<td>Uterus</td>
<td>Vasculature</td>
</tr>
<tr>
<td>Oxygenation</td>
<td>Heart rate and rhythm</td>
<td>Contraction strength</td>
<td>Blood pressure</td>
</tr>
<tr>
<td>Supplemental oxygen</td>
<td>Blood pressure</td>
<td>Baseline uterine tone</td>
<td>Volume status</td>
</tr>
<tr>
<td>Respiratory status</td>
<td>Fluid bolus</td>
<td>Contraction frequency</td>
<td>Mother-informed consent</td>
</tr>
<tr>
<td>Oxygen therapy</td>
<td>Correct hypotension</td>
<td>Baseline uterine tone</td>
<td>Anesthesia options</td>
</tr>
<tr>
<td>Baseline uterine tone</td>
<td>Correct hypotension</td>
<td>Baseline uterine tone</td>
<td>Blood products</td>
</tr>
<tr>
<td>Baseline uterine tone</td>
<td>Correct hypotension</td>
<td>Baseline uterine tone</td>
<td>Intravenous access</td>
</tr>
<tr>
<td>Baseline uterine tone</td>
<td>Correct hypotension</td>
<td>Baseline uterine tone</td>
<td>Urinary catheter</td>
</tr>
<tr>
<td>Baseline uterine tone</td>
<td>Correct hypotension</td>
<td>Baseline uterine tone</td>
<td>Abdominal prep</td>
</tr>
<tr>
<td>Baseline uterine tone</td>
<td>Correct hypotension</td>
<td>Baseline uterine tone</td>
<td>Transfer to OR</td>
</tr>
<tr>
<td>Baseline uterine tone</td>
<td>Correct hypotension</td>
<td>Baseline uterine tone</td>
<td>Medical considerations</td>
</tr>
<tr>
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<td>Correct hypotension</td>
<td>Baseline uterine tone</td>
<td>Obstetric considerations</td>
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**Summary**

Standard Definitions and Standard Interpretation ensure FACTUAL ACCURACY

A systematic, non-random, ABCD approach to management provides the team with a simple tool to help ARTICULATE a thoughtful plan

Factual accuracy and ability to articulate a plan promote credibility, reasonableness and standard of care

**Frequently Asked Questions**

Cord gases
Documentation requirements
Arrhythmias
Offers of proof
Elements of a successful suit
Physicians should attempt to obtain venous and arterial cord blood samples in the following situations:

- Cesarean delivery for fetal compromise
- Low 5-minute Apgar score
- Severe growth restriction
- Abnormal fetal heart rate tracing
- Maternal thyroid disease
- Intrapartum fever
- Multifetal gestations