Intrapartum Fetal Heart Rate Monitoring
Applying Principles of Patient Safety

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Objectives: at the end of this session participants will be able to:

1. Communicate the information obtained from fetal heart rate (FHR) tracings using standardized terminology
2. Interpret the physiologic significance of FHR tracings using three central concepts of standardized interpretation
3. Employ standardized approach to FHR management that incorporates ACOG/AAP recommendations to minimize potential sources of preventable error

Electronic Fetal Monitoring has the potential to be a source of risk or a source of opportunity

This is entirely dependent upon the expectations of the user

If fetal monitoring is used as a diagnostic test for damaging metabolic acidemia or neurologic injury, it will almost always be a source of risk

If fetal monitoring is used for its positive predictive value rather than its negative predictive value, it will almost always be a source of risk

If fetal monitoring decisions are based on random recall rather than evidence-based consensus, risk is inevitable

On the other hand, if fetal monitoring is applied, interpreted and managed within the well-documented limits of its capabilities, it can be the difference between success and failure

In fact, if used thoughtfully, fetal heart rate monitoring can be the “forcing function” that helps ensure intrapartum management is conducted in accordance with the standard of care

Financial Relationships/Disclosures for Presenters at Educational Programs
I have the following relevant financial relationship with a commercial interest:


Co-author: “Electronic Fetal Heart Rate Monitoring Interpretation and Management” On-line, Interactive Educational Program: Distributed by GE Healthcare

Consulting agreement
Clinical Computer Systems, Inc Makers of OBIX
Forcing Function

A “forcing function” is a critical step in an algorithm that specifically prevents the user from taking a subsequent action without consciously considering information relevant to that action.

It forces conscious attention upon the action, deliberately preventing rote performance of the action, reducing the risk of error and increasing the likelihood that the action will be reasonable.

Regardless of individual opinions concerning the utility of fetal monitoring, unless we are willing to abandon it entirely, we will always be obligated to use it in accordance with the

“Standard of Care”

“Standard of Care”

Legal concept with a legal definition

Level of care expected of a reasonable practitioner

Who makes that decision?

The details differ from case to case

But the basic legal disagreement is always the same
Factual Accuracy

Start with the basics

Deconstruct fetal heart rate monitoring into its essential components

Definitions

- Baseline
- Variability
- Accelerations
- Decelerations (early, late, variable, prolonged)
- Sinusoidal pattern

FHR monitoring consists of three components:

Intrapartum FHR Monitoring

Definition Interpretation Management

Definitions

- Baseline – Mean FHR rounded to 5 bpm in 10 min
- Accelerations – Abrupt 15 x 15 rise
- Decelerations
  - Early – Gradual, nadir coincides with peak of contraction
  - Late – Gradual, nadir after peak of contraction
  - Variable – Abrupt, 15 x 15
  - Prolonged – Last 2-10 minutes

Definitions

- Variability
- Sinusoidal pattern

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
Variability is defined as “fluctuations in the baseline that are irregular in amplitude and frequency.”

The sinusoidal pattern demonstrates “fluctuations in the baseline that are regular in amplitude and frequency.”

The 2008 NICHD Workshop Report on Electronic Fetal Monitoring

A very brief update

The 2008 NICHD Workshop Report on Electronic Fetal Monitoring
Old system:
Reassuring
Non-reassuring

“Three-Tier” Fetal Heart Rate Classification System
Category I – “Normal”
Baseline rate: 110-160 bpm
Variability: Moderate
Decelerations: No late, variable or prolonged

“Three-Tier” Fetal Heart Rate Classification System
Category III – “Abnormal”
1. Absent variability with recurrent late decelerations
2. Absent variability with recurrent variable decelerations
3. Absent variability with bradycardia for at least 10 min
4. Sinusoidal pattern for at least 20 min

Category II?
Everything Else

Definitions – Factual Accuracy

Components | Summary
---|---
Baseline | Category I
Variability | Category II
Accelerations | Category III
Decelerations
Sinusoidal pattern

It is always acceptable to document components alone.
Documenting categories alone always omits potentially critical information and usually is not preferable.

Interpretation

Focusing on Level I and Level II evidence, fetal monitoring interpretation can be distilled into 2 central principles:

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?

Start at the top
What information does the FHR tracing provide regarding oxygen transfer?

Interruption of the oxygen pathway by compression of the umbilical cord can result in a variable deceleration

Interruption of the oxygen pathway at the level of the uterus or placenta can result in a late deceleration
Interruption of the oxygen pathway at any point can result in a prolonged deceleration.

ALL clinically significant FHR decelerations (late, variable, prolonged) HAVE EXACTLY THE SAME TRIGGER...

Interruption of the oxygen pathway at one or more points

Why were we taught that late decelerations are “ominous” but variable decelerations are “benign”?

“In contradistinction to the situation with variable decelerations, the mere presence of late decelerations is ominous” (because of more low pH values)


No published study comparing lates and variables has ever controlled for known confounding factors:

- Baseline rate
- Variability
- Accelerations
- Frequency of decelerations
- Duration of decelerations
- Total number of decelerations
In a fetus exhibiting either moderate variability or accelerations of the FHR, damaging degrees of hypoxia-induced metabolic acidemia can reliably be excluded.

“The superb reliability of accelerations and moderate variability in excluding any degree of hypoxia-related central nervous system depression or risk of ongoing hypoxic injury would allow observation of patterns with these features and adequate labor progress regardless of the deceleration pattern.”

Intrapartum Management of Category II Fetal Heart Rate Tracings Towards Standardization of Care

- Steven L. Clark, M.D.
- Michael P. Nageotte, M.D.
- Thomas J. Garite, M.D.
- Roger K. Freeman, M.D.
- David A. Miller, MD.
- Kathleen Rice Simpson, R.N. Ph.D.
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- Richard L. Berkowitz, M.D.
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Principles:

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

- **Principle #2**: Moderate variability or accelerations exclude ongoing hypoxic injury
Factual accuracy is facilitated by:

Accurate definitions and evidence-based interpretation that is consistent with published consensus in the literature.

Is this simple enough to be taught and retained?

In 2009, the Los Angeles County Department of Health mandated FHR competency testing (OVMC, HUCLA, LAC+USC).

After a series of training sessions on standard NICHD FHR definitions, NICHD categories and 3 simplified principles of interpretation, a formal written test was administered to all care providers at all levels.

A two-year quality improvement initiative to standardize the methods by which obstetric team members interpret, communicate, document and manage fetal heart rate tracings.

400 representatives from 90 of New York’s 140 hospitals.

Pre and post-test mean percent correct responses:

- Pre-test 6/7-09: 49%
- Post-test 6/7-09: 85%
- Post-test 12-09: 80%
- Post-test 12-10: 84%

Interobserver Reliability of Fetal Heart Rate Pattern Interpretation Using NICHD Definitions

Reviewers demonstrated agreement on:

- Baseline rate: 0.97
- Moderate variability: 0.80
- Accelerations: 0.62
- Decelerations: 0.63
- Category: 0.68
- Exclude on-going hypoxic injury: 0.82

Kappa values and agreement:

- < 0.40: Poor
- 0.41 – 0.60: Substantial
- 0.61 – 0.80: Moderate
- 0.81 – 1.0: Excellent


Causes of disagreement:

- Eyeballing it
- Winging it
- Improvising
- Bending the rules
- Close enough for government work
Standardized management is the next challenge

Standardized management **DOES NOT** replace clinical judgment

On the contrary, standardized management is intended to serve as a "forcing function" to encourage the systematic application of clinical judgment and ensure that management decisions are made in a timely fashion.

Risk factors for error
- Random recall
- Lack of a checklist
- Unnecessary complexity

One end of the FHR spectrum – Category I

What do I call it?
Baseline rate... 130 bpm
Variability... moderate
Accelerations... present
Decelerations... absent
Changes or trends over time... none

What does it mean?
Standardized Intrapartum FHR Management

**Four Elements**

**“ABCD”**

A – Assess the oxygen pathway
B – Begin corrective measures

<table>
<thead>
<tr>
<th>&quot;A&quot; Assess Oxygen Pathway</th>
<th>&quot;B&quot; Begin Corrective Measures Indicated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lungs</td>
<td>Supplemental oxygen</td>
</tr>
<tr>
<td>Heart</td>
<td>Positive changes</td>
</tr>
<tr>
<td>Oliguria</td>
<td>Restricted/stop</td>
</tr>
<tr>
<td>Maternal</td>
<td>Oliguria</td>
</tr>
<tr>
<td>Fetal</td>
<td>Oliguria</td>
</tr>
<tr>
<td>Decision</td>
<td>Reduced/stop</td>
</tr>
<tr>
<td>Epidural</td>
<td>Reduced/stop</td>
</tr>
<tr>
<td>Cord</td>
<td>Cordotomy</td>
</tr>
</tbody>
</table>
What fetal heart rate characteristics tell you it is safe to continue surveillance?

If you have any question...

...the safest approach is to proceed to the next step

“C”

Cesarean?
Call for Cesarean?
Crash Cesarean?
Call for the vacuum?
Commit to cesarean?
Commit to delivery?
Cancel clinic?

Standardized Intrapartum Management

“ABCD”

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

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

**This does NOT commit the patient to delivery**

It simply serves as a “forcing function” to identify common sources of unnecessary delay in a systematic way so they can be addressed in an organized and timely fashion.

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**“I’m not sure”**

Forcing Function

**Take the next step!**

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Clear obstacles to rapid delivery

A Category II tracing that does not improve completely with corrective measures is a daily occurrence on L&D.

Approaching such a common occurrence with an orderly, systematic plan of action that is factually accurate and can be articulated clearly and understandably demonstrates reasonableness and helps ensure compliance with the standard of care.

There is no need to reinvent the wheel every time this happens.

Let fetal monitoring simplify your life.

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**Consider individual characteristics of**

Facility

Staff

Mother

Fetus

Labor
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As long as the tracing demonstrates moderate variability or accelerations

And there is normal progress in the active phase or second stage of labor

Continued surveillance is acceptable

Even in the setting of recurrent decelerations for an hour or more

Caveats

Latent labor or early active labor remote from delivery

Suspected abruption or uterine rupture

If the tracing DOES NOT demonstrate moderate variability or accelerations

The recommended cut-off is:

30 minutes with recurrent decelerations

60 minutes without recurrent decelerations

KEEP IT SIMPLE!!!!!
Definitions
Variability is defined as **fluctuations** in the baseline that are **irregular** in amplitude and **frequency**

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

**Principle #2**
Moderate variability or accelerations exclude ongoing hypoxic injury

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Intrapartum Fetal Heart Rate Management Decision Model

<table>
<thead>
<tr>
<th>Category</th>
<th>FHR and uterine activity</th>
</tr>
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<tbody>
<tr>
<td>I</td>
<td>Confirm FHR and uterine activity</td>
</tr>
<tr>
<td>II or III</td>
<td>Confirm FHR and uterine activity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>“ABCD”</th>
<th>AC – Assess oxygen pathway</th>
<th>BC – Begin corrective measures</th>
<th>CD – Clear obstacles to rapid delivery</th>
<th>DC – Determine decision to delivery time</th>
</tr>
</thead>
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- Every 30 min in the 1st stage of labor
- Every 15 min in the 2nd stage of labor
- Every 5 min in the 3rd stage of labor

- Routine Surveillance
- Heightened Surveillance
- Expedite Delivery

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Deciding to wait

Versus
Waiting to decide

Kickin’ the can down the road
Summary

A simple, standard, factually accurate and articulate approach to intrapartum FHR definition, interpretation and management demonstrates *reasonableness*

The essential element that defines the standard of care