Intrapartum Fetal Monitoring: Are we there yet?

David F. Lewis MD
Professor and Vice Chair
MFM Fellowship Program Director
University of Cincinnati
How did I learn EFM?
Intrapartum Fetal Monitoring

- Many problems exist regarding this technology in obstetrical care.
- Not proven to be of benefit in patient care, in fact the randomized trials demonstrated increased rates of section in the monitoring group.
- Is the most common tool used against us medically legally.
Why??

• Several prospective randomized trials did not show a benefit to use of this modality.
• In meta-analysis the use of EFM increased the section rate over intermittent auscultation to OR 1.53 (CI 1.17-2.01) and for suspected “fetal distress” OR 2.55 (CI 1.81-3.53), (Vintzileos OB GYN 1995)
• Increase vacuum and forceps deliveries OR 1.23 (CI 1.02-1.49), OR 2.4 (CI 1.97-3.2)
But it improves outcome? Right

- No reduction in the perinatal mortality rate has been seen
- OR 0.87 95% CI (0.57 – 1.33)
- There has been a decrease in fetal hypoxia with OR 0.47 95% CI (0.17 to 0.98)
- Almost 20,000 patients in these randomized trials
- It is hard to argue with the data
What about CP?

- The positive predictive value of a non-reassuring fetal heart rate pattern to predict cerebral palsy for a fetus over 2500 grams is 0.14%.
- This means you section 1000 patients for non-reassuring FHT and you prevent a case of CP.
- False positive rate is over 99%.
Cerebral Palsy

- Only 4% has been attributed to intrapartal events
- Over 70% occur before the onset of labor
- ACOG has done a wonderful thing for us to help us medico legally
So let's all throw the machines away!!!!!!

- I would not recommend this.
- We do have many problems with the use of the machine.
- If you go to intermittent fetal heart rate auscultation, get ready to double your nursing staff.
- When you do have a bad outcome, get ready for more litigation!!!
What about asphyxia?

- We know the patients for risk of intrapartum asphyxia; preeclampsia, diabetics, chronic hypertension, so if we just monitor them we should be good, Right??
- Low et. Al. AJOG found 63% of asphyxiated fetus’s at term had no risk factors
### How common do we use it???

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>45%</td>
</tr>
<tr>
<td>1988</td>
<td>62%</td>
</tr>
<tr>
<td>1992</td>
<td>74%</td>
</tr>
<tr>
<td>2002</td>
<td>85%</td>
</tr>
</tbody>
</table>
What are our problems?

• Interpretation
• We do not all speak the same language.
• We use the machine to help us take the easy way out many times as Obstetricians.
• Nursing plays a major role in the section rate particularly in a private hospital.
• Let’s look at these problems first.
Interpretation of EFM

• The good thing about EFM is that I (you) are an expert, and we all know exactly when to intervene to prevent damage.

• It is amazing to go to a court room and to hear some “expert” say at exactly 11:23 am if you would have sectioned her this baby would have been fine instead of allowing a vaginal delivery at 1:04 pm.
Interpretation of EFM

- Helfand et al. AJOG 1985. 4 Obstetricians interpreted 50 tracings; they only agreed in 22% of the cases.
- When they looked at the same cases 2 months later, they changed their interpretation 21% of the time.
- Not very impressive, is it.
Interpretation of EFM

- Nielsen et al Acta OB GYN Scand. 1987
- 5 obstetricians independently interpreted 150 tracings.
- They only interpreted the tracing similarly in 29% of the cases.
- These were very seasoned obstetricians.
- Why the variability in results??
Why???

• We do not all speak the same language!!

• We may know definitions of specific findings, such as late deceleration, accelerations, variable deceleration, etc., but we can not put the whole thing together.

• It is extremely important for this to occur for us to determine what is important and what is the best action to take.
Intrapartum Fetal Heart Rate Monitoring: Nomenclature, Interpretation, and General Management Principles
2008 NICHD Workshop

- Joint effort by NICHD, ACOG, SMFM
- Purpose to Standardize Nomenclature, definitions and interpretative system
- This should help us all speak the same language and be able to study the difficult cases in more detail
- You must learn the language.
- It is coming up in court. I encourage your residents to start using the nomenclature in notes on labor and delivery.
2008 NICHD Workshop

Background

These terms apply to intrapartum monitoring but can be used for Antepartum Fetal Heart Rate Monitoring.

Must have strip that is of good enough quality that you can interpret.

No use of short and long term variability anymore.
2008 NICHD Workshop

Background

A full description of an EFM tracing requires a qualitative and quantitative description of:

1. Uterine Contractions
2. Baseline fetal heart rate
3. Baseline FHR Variability
4. Presence of Accelerations
5. Periodic or episodic decelerations
6. Changes or trends of FHR patterns over time.
Uterine Contractions

• Number of contractions in 10 minutes averaged over 30 minutes (frequency)
• Also should access duration, intensity and relaxation time between contractions.
• All of the above must be evaluated to determine characteristics of labor.
Uterine Contractions-Normal

• ≤ 5 contractions in 10 minutes averaged over a 30 minute window.
Uterine Contractions - Tachysystole

- > 5 contractions in 10 minutes averaged over during a 30 minute window.
- Term applies to both stimulated labor or spontaneous labor.
Uterine Contractions

- Old terms that should not be used
- Hyperstimulation
- Hypercontractility
- Forget them if you can
Forget This!!!!!!

Uterine Hyperstimulation

Uterine hyperstimulation is defined as greater than 5 contractions per 10 minutes (here 5 contractions in 7 minutes).
Fetal Heart Rate Monitoring

- Baseline
- Variability
- Accelerations
- Deceleration
Baseline FHR

• Rounded off to 5 beats per minute during a 10-minute window excluding accelerations and decelerations and periods of marked FHR variability (>25 bpm)

• Abnormal baselines <110 or >160 bpm.
Variability: Do differentiate in short and long term variability. Should be visualized as a unit.

<table>
<thead>
<tr>
<th>Amplitude Range</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undetectable</td>
<td>Absent</td>
</tr>
<tr>
<td>Undet to &lt; 5 beats/min</td>
<td>Minimal</td>
</tr>
<tr>
<td>6 to 25 beats/minute</td>
<td>Moderate</td>
</tr>
<tr>
<td>More than 25 beats/min</td>
<td>Marked</td>
</tr>
</tbody>
</table>
FHR Acceleration

- Abrupt increase in FHR for less than 30 seconds
- Most be over 15 bpm for 15 seconds
- A prolonged acceleration last for over 2 minutes but less than 10 minutes
- An acceleration lasting over 10 minutes is a baseline change.
- Use 10 bpm for 10 seconds for less than 32 weeks EGA
FHR Deceleration

- Classified as Early, Late and Variable
- Very specific definitions given now
Late Deceleration

- Symmetrical gradual decrease and return of the FHR associated with a contraction
- Gradual FHR decrease accrues after the peak of the contraction
Early Deceleration

- Gradual decrease in FHR associated with a contraction
- Nadir of FHR is same as peak of contraction
Variable Deceleration

• Abrupt decrease in FHR
• The decrease in FHR is \( \geq 15 \text{ bpm} \) lasting \( \geq 15 \text{ sec} \) but \( < 2 \text{ minutes} \) in duration
Variable Decelerations

• May be accompanied by other characteristics which need investigation.
• Such as slow return to baseline, tachycardia after the end of the decelerations called over shoots or shoulders, and fluctuations in the FHR in the trough of the deceleration.
Fetal Monitor Patterns

**Fetal Heart Rate**

- **Healthy acceleration**
- **Normal Range:** 120-150 bpm

**Contraction**

- **Baseline fetal heart rate is 120-150, preserved beat-to-beat and long-term variability. Accelerations last for 15 or more seconds above baseline, and peak to 15 or more bpm.**

**Reassuring Pattern**

- **Late Deceleration with Variability Loss**
  - Fetal heart rate lags behind contractions, with little or no variability in line. Persistent late decelerations associated with decreased variability is an ominous pattern.

**Variable Decelerations**

- Variable decelerations are variable in duration, intensity, and timing. Acceleration-deceleration-acceleration is due to compression and decompression of cord.

**Severe Variable Decelerations**

- Severe decelerations have depth below 70 bpm, and a duration longer than 1 minute. Persistent variable decelerations may lead to acidosis and fetal distress.
Prolonged Deceleration

- Decrease in FHR that is over 15 BPM and last over 2 minutes but less than 10 minutes
Sinusoidal Fetal Heart Rate

- Visually smooth wave like pattern with cycle frequency of 3-5 minutes that persists for ≥ 20 minutes.
Quantifying Decelerations

• Time in minutes and seconds from beginning to end
• Magnitude of deceleration in BPM.
• No grading of Decelerations. This has not be verified by studies.
• Decelerations are called recurrent if they occur >50% of the time in any 20 minute window.
• If less than 50% of the time, then called intermittent.
Interpretation of FHR Pattern

- Remember this evolves over time or is dynamic process.
- You must reassess frequently.
- Interpret FHR tracing taking the whole clinical situation at that time
- Categorization of FHR tracing is limited to the time period assessed.
Fetal Heart Rate Accelerations

- Presence predicts absence of fetal acidosis

- Absence of fetal accelerations does not mean the fetus has hypoxia or acidosis.

- The presence of marked fetal variability is unclear (Saltatory).
Interpretation of FHR Patterns

- A Three Tiered System was developed
- Use of this system will give the user some idea as to the acid status of the fetus.
- Disclaimer: Use of this FHR pattern cannot predict the development of Cerebral Palsy.
- Only a point in time. This changes
- Categories can change and management plans should change with categories.
Category I

- NORMAL (what is that???)
- Normal acid base status of the fetus
- Follow in a routine fashion
- No specific action required
Category II

- FHR tracings are INDETERMINATE.
- Not predictive of abnormal fetal acid base status, however we do not have enough information to place these in category I or III.
- Close evaluation and continued monitoring is indicated taking into account the clinical situation.
Category III

• Are ABNORMAL.
• These do predict fetal acidosis at that the time of observation.
• Require prompt evaluation and action.
• Must try to correct the situation as quickly as possible.
Ways to correct Category III Tracings

- Maternal Oxygen
- Change maternal Position
- Stop labor stimulant
- Treat maternal hypotension
Category I-Must have all of the following

- Baseline rate 110-160
- Baseline FHR variability moderate
- No late or variable decelerations
- Can have early decelerations
- Accelerations present or absent
Category II-includes everything that is not a I or a III

- Baseline rate:
- Bradycardia not accompanied by absent baseline variability
- Tachycardia
Category II

- Baseline FHR Variability
- Minimal baseline variability
- Absent baseline variability without recurrent decelerations
- Marked baseline variability
Category II

• Accelerations
• Absence of induced accelerations after fetal stimulation
Category II

- Periodic or Episodic Decelerations
- Recurrent variable decelerations accompanied by minimal or moderate baseline variability.
- Prolonged decelerations $\geq 2$ minutes but $<10$ minutes.
- Recurrent late decelerations with moderate baseline variability
- Variable decelerations with slow return or “overshoots” or shoulders
Category III

- Absent Baseline FHR variability and
  - Recurrent late decelerations
  - Recurrent variable decelerations
  - Bradycardia

Sinusoidal Pattern
Research

• This will help with research.
• Many different studies have been suggested by the group.
• We need to answer these questions to really know what is going on in labor and delivery.
• It is amazing that we have not answered these questions already.