Intermittent Auscultation: Evidence versus Expert Opinion

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Disclosure

- I have no financial disclosures related to this topic or presentation

Objectives

1. Definition of Intermittent auscultation (IA)
   - What FHR characteristics are detectable with IA?
2. What evidence supports IA and how good is it?
3. What are the best IA protocols?

Definition: Intermittent Auscultation or Intermittent Monitoring?

- Intermittent auscultation: The fetal heart rate is assessed via a hand-held Doppler or Pinard stethoscope at set intervals without a display of the resulting pattern
- Intermittent monitoring: uses the electronic fetal monitor and Doppler to record the FHR for a set period of time and may include a recorded display of the FHR pattern
- Hybrid model of using machine Doppler for IA with or without a recorded display of the FHR pattern

Lewis D et al FIGO guidelines 2015
What FHR Characteristics Can Be Detected?

<table>
<thead>
<tr>
<th>Pinard or Hand-held Doppler</th>
<th>Electronic Monitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate</td>
<td>Rate</td>
</tr>
<tr>
<td>Accelerations</td>
<td>Accelerations</td>
</tr>
<tr>
<td>Deceleration: presence or absence</td>
<td>Decelerations: type can be identified</td>
</tr>
<tr>
<td>Variability: no (well maybe)</td>
<td>Variability can be detected</td>
</tr>
<tr>
<td>Maternal HR</td>
<td>Maternal HR can be confused with FHR</td>
</tr>
<tr>
<td>Clarify double or half counting of EFM</td>
<td></td>
</tr>
</tbody>
</table>

Objectives

1. Definition of Intermittent auscultation (IA)

2. What evidence supports IA and how good is it?
   - RCTs of IA vs EFM
   - Observational studies of birth outcomes in settings that do not use EFM
   - RCTs of Pinard vs Doppler

3. What are the best IA protocols?

RCTs: Protocol for IA

- Q 15 min active phase for 30-60 sec after a UC and q 5 minutes in the second stage
- 1:1 nursing (in most but not all the RCTs)
- Fetal distress defined differently in each RCT but for the most part included:
  - < 120 bpm or >160 bpm
  - < 100 bpm after 3 UCs or “persistent < 100 bpm
  - < 100 bpm immediately after UC.
  - Irregular FHR
  - Clinician judgment

RCTS: Protocol of EFM

- 1:1 nursing (in most but not all the RCTs)
- Fetal distress defined differently in each RCT but for the most part included:
  - Late decelerations
  - Severe variable decelerations
  - Bradycardia for 15 minutes
  - Tachycardia without variability
  - Undefined
Summary of RCTs

- 13 RCTs (~37,000 women). All conducted before 1994
- Most were not of high quality. Review heavily influenced by the large Dublin trial of 1985 that included 1:1 nursing care
- No difference in perinatal mortality, or cerebral palsy (moderate quality evidence)


Summary of RCTs

- ~60% increase in cesarean section in IA vs EFM trials (RR 1.63, 95% CI 1.29-2.07) (low quality evidence)
  - No difference in cesarean section in the one IA vs intermittent EFM trial (RR 1.29, 95% CI 0.84 to 1.97) (low quality evidence)
- ~50% decrease in early neonatal seizures in EFM group overall (RR 0.50, 95% CI 0.31 to 0.80) (moderate quality evidence)


Summary of RCTs

- On the basis of this body of evidence, ACOG, AWHONN and ACNM all state:
  - IA with 1:1 nursing care, or continuous EFM are acceptable methods of monitoring the fetus in active labor, in women who are “low risk.”


What Can We Conclude from the RCTs?

- The FHR characteristics known today to be associated with fetal acidemia were not known or consistently included in study protocols
- The increase in CS rate in EFM groups could be secondary to the definitions of fetal distress
- The lower CS rate in IA groups could be secondary to not listening appropriately in the IA group
- So let’s start over: Given what we know today about the relationship between FHR patterns and acidemia..
Do We Need to Continuously Assess Variability?

- The purpose of fetal surveillance in labor is to identify the fetus at risk for having clinically significant metabolic acidemia
  - How often does metabolic acidemia occur?
  - How often do Category III FHR patterns occur?
- Metabolic acidemia is a rare occurrence in term infants:
  - Incidence of pH < 7.0 is 3.7/1000 (~ 23% will have significant morbidity or mortality)
  - Incidence of HIE is 2.5/1000 live births

Graham EM 2008

Do We Really Need to Continuously Assess Variability?

- Category III FHR patterns develop over time or as an acute bradycardia
  1. Category III FHR patterns that develop over time are detected via IA (recurrent decelerations)
     - Incidence is ~ 1/900 in women at term with singleton pregnancy
     - Exception is sinusoidal pattern associated with Rh isoimmunization
  2. Incidence of acute bradycardia in population of low and high risk women is ~0.8%
     - Most of these have known causes that are contraindications for IA


Screening for a rare event with a series of more and more refined filters

Effectiveness of IA in Low-Risk Populations

- Multiple population-based studies and Cochrane meta-analysis have shown positive outcomes for women who give birth at home or in free-standing birth centers
- Positive outcomes are dependent on appropriate risk screening and appropriate transfer to a hospital setting when needed
- Bottom line: Strict risk screening and an integrated system for transfer of care obviates the need to monitor variability throughout labor

Objectives

1. Definition of Intermittent auscultation (IA)
2. What evidence supports IA and how good is it?
3. What are the best IA protocols?
   - Who is "low-risk?"
   - How should IA be performed?

Who is Low Risk?

A Priori Antepartum Risk and Newborn Outcomes

- Adverse neonatal outcome: NICU admission for UA pH <7.10 or 5-min Apgar < 7
- 59.8% of adverse outcomes occurred in high-risk group

<table>
<thead>
<tr>
<th>Initial risk score</th>
<th>Risk category</th>
<th>N</th>
<th>Percent of cohort</th>
<th>Incidence of adverse neonatal outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
<td>Low</td>
<td>6511</td>
<td>21.2%</td>
<td>0.23%</td>
</tr>
<tr>
<td>4-6</td>
<td>Moderate</td>
<td>15676</td>
<td>51.1%</td>
<td>0.57%</td>
</tr>
<tr>
<td>7-14</td>
<td>High</td>
<td>8515</td>
<td>27.7%</td>
<td>1.83%</td>
</tr>
</tbody>
</table>

Intrapartum Risk and Newborn Outcomes

Intrapartum predictors of adverse neonatal outcome in group with high a priori risk

| Table 4. Individual predictors of adverse neonatal outcome, initial risk score model |
|---------------------------------|---------------------------------|---------------------------------|----------------------------------|
| Maternal age > 35 years         | Current BMI                     | Gestational age                 |
| Nulliparity                     | Maternal diabetes               | Maternal hypertension           |
| Pre-eclampsia                   | Placental abruption             | Induction of labor              |
| Category II FHR in the first hour of monitoring |

Abbreviations: BMI, body mass index; FHR, fetal heart rate.

Holmgren CM 2013
Intrapartum Risk and Newborn Outcomes

- Intrapartum predictors of adverse neonatal outcome in group with high a priori risk

<table>
<thead>
<tr>
<th>Intrapartum risk score</th>
<th>Risk category</th>
<th>N</th>
<th>Percent of initial high-risk cohort</th>
<th>Incidence of adverse neonatal outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–1</td>
<td>Low</td>
<td>3853</td>
<td>45%</td>
<td>1.0%</td>
</tr>
<tr>
<td>2–6</td>
<td>Moderate</td>
<td>4378</td>
<td>51%</td>
<td>1.9%</td>
</tr>
<tr>
<td>7–14</td>
<td>High</td>
<td>284</td>
<td>3%</td>
<td>11.3%</td>
</tr>
</tbody>
</table>

Maude RM 2014, FIGO 2015

Who is Low Risk Before Labor? New Zealand and FIGO Guidelines

- Conditions required for considering and maintaining intermittent auscultation in settings where cardiotocography is available.

<table>
<thead>
<tr>
<th>Antepartum factors</th>
<th>Intrapartum factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>No serious previous maternal health conditions</td>
<td>Normal frequency of contractions</td>
</tr>
<tr>
<td>No maternal diabetes or pre-eclampsia</td>
<td>No labor induction or augmentation</td>
</tr>
<tr>
<td>No antenatal vaginal hemorrhage</td>
<td>No epidural analgesia</td>
</tr>
<tr>
<td>Normal fetal growth, amniotic fluid, and Doppler</td>
<td>No abnormal vaginal hemorrhage</td>
</tr>
<tr>
<td>Normal antenatal cardiotocography readings</td>
<td>No fresh or thick meconium</td>
</tr>
<tr>
<td>No previous uterine scar</td>
<td>No maternal temperature &gt; 38°C</td>
</tr>
<tr>
<td>Normal fetal movements</td>
<td>Active first stage lasting &lt; 12 hours</td>
</tr>
<tr>
<td>No rupture of membranes lasting &gt; 24 hours</td>
<td>Second stage lasting &lt; 1 hour</td>
</tr>
<tr>
<td>Singleton, term, cephalic presentation</td>
<td>Clearly audible fetal heart rate sounds in normal range</td>
</tr>
</tbody>
</table>

Who Needs EFM?

- Some examples:
  - Meconium
  - Increased vaginal bleeding
  - Fever
  - Need for analgesia
  - FHR abnormalities
  - Maternal request

ACNM 2015, AWHONN 2015

How Should IA be Performed?

- Obtain maternal pulse
- Palpate uterine contractions
- Leopold’s maneuver to determine position of fetal back and point of maximal sound intensity
- Auscultate FHR at the same time you obtain maternal pulse to make sure you have the correct heart rate
Methods of Performing IA: Four Key Decisions!

1. When do you listen relative to UCs?
2. How long do you listen?
3. How often do you listen?
4. How do you count? Multi-count strategies that have been tested

ACNM 2015, AWHONN 2015

1. When Do you Listen?

- AWHONN and ACOG: Immediately after a UC for 30-60 sec
- ACNM: During the UC and for a period after the UC ends
- Let's look at what works best

ACNM 2015, AWHONN 2015, ACOG 2010, FIGO 2015

When to Auscultate: Should We Count for 30 Sec After These UC’s are Over?

2. How Long Do You Listen?

- AWHONN: 30-60 sec
- ACNM: 15-60 sec
- NICE and FIGO: 60 sec
- I say, long enough to make sure you are not missing a deceleration

ACNM 2015, AWHONN 2015, ACOG 2010, FIGO 2015
3. How Often Do You Listen?

<table>
<thead>
<tr>
<th>Organization</th>
<th>Latent Phase</th>
<th>Active Phase</th>
<th>Second Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>American College of Nurse-Midwives</td>
<td>15-30</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>American College of Obstetricians and Gynecologists</td>
<td>30</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>American College of Obstetricians and Gynecologists and American Academy of Pediatrics Joint Guidelines for Perinatal Care</td>
<td>15</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Association of Women's Health, Obstetric And Neonatal Nurses</td>
<td>15-30</td>
<td>5-15</td>
<td></td>
</tr>
<tr>
<td>Royal College of Obstetricians and Gynecologists</td>
<td>15</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Society of Obstetricians and Gynecologists of Canada</td>
<td>15-30</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Note: The guidelines of the professional organizations included here specifically define low risk. For the purpose of this bulletin, low risk refers to women who have no medical or obstetric conditions that are associated with unregulated uterine contractions or conditions that are associated with an increased incidence of unexplained uterine contractions.

4. How Do You Count?

How to Auscultate:

- Count for a full minute
- Count for 30 seconds and multiply x 2
- Count for 15 seconds and multiply x 4
- Count for 10 seconds and multiply x 6
- Count for 6 seconds and multiply x 10
- Count for 5 seconds and multiply x 12

Single Count vs Multiple Count Strategy

- Single count strategy
- Multiple count strategy:
  - Three 10 sec counts separated by 5 sec breaks

Schifrin BS 1992, Harrison J 2004
IA Method: Hints from Practitioners

- Listen through a contraction a few times at the beginning
- Start listening at the peak of a contraction and for a bit after it ends
- Frequency should be based on how often the woman is having contractions rather than set times

Summary Recommendations From All This Data….

- Risk screening is the most essential first step!
  - Women who do not have an antepartum or intrapartum risk factor for acidemia have an extremely low risk of developing acidemia unless recurrent decelerations appear during labor. Therefore….
Summary Recommendations From All This Data:

- Use a multi-count strategy
- Start at the peak of a UC or before a UC starts
- Continue counting for 30 sec after the UC is over
- Frequency should increase during rapid descent, following SROM and at the onset of maternal pushing
- Listen every other or every third UC during pushing expulsive stage

Policy for Using IA in a Hospital Setting Should Include:

- Indications for IA
- Contraindications for IA
- Indications for moving from IA to EFM
- Frequency of Assessment
- Method of Assessment
- Documentation
- Ongoing or periodic competency assessment

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Do You Need an Admission Strip?

- 4 RCTs, with 13,000 women
- Admission EFM associated with:
  - increased risk of CS by 20%
  - No difference in operative vaginal birth
  - No difference in perinatal death, NICU admission, Apgar scores, or hypoxic ischemic encephalopathy
  - EFM group more likely to have continuous EFM

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Thank You

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Feinstein N 2009, ACOG 2015

Devane D Cochrane review 2012
Resources


ADDITIONAL SLIDES

Reliability and Efficacy of IA

Benefits and Limitations of IA

Pinard vs Dopplar

- Few small studies have compared Pinard vs Doppler using EFM as gold standard
  - Doppler may be associated with better neonatal outcomes
  - Doppler with digital display of FHR is more accurate for assessing FHR characteristics

Mahomed K et al 1994, Simpson et al 1999

Reliability of IA

- Multi-count strategy that assesses the fetal heart rate during and after a contraction reliably detects:
  - Fetal heart rate
  - Rhythm
  - Accelerations
  - Presence of decelerations

Reliability of IA

- Multi-count strategy using 6-10 second time frames accurately detects and characterizes accelerations in women who are not in labor
- Does not differentiate types of decelerations or determine baseline variability with accuracy


Reliability of IA

- Clinicians listening to an audio recording failed to detect late decelerations with and without variability 18% and 33% of the time respectively (Miller FC 1984, Strong TH 1993)
- However, a multi-count algorithm of three 10-second counts separated by 5 second breaks identified 93% of late decelerations (Shiffrin BS 1992)


Reliability of IA

- Assessment of baseline rate is less accurate when the baseline rate is high


Efficacy of IA

- IA for FHR assessment in women who are undergoing a trial of labor after a cesarean section:
  - 100 women randomly assigned to IA vs EFM
  - IA conducted q 15 min in first stage and q 5 min in second stage
  - Single count strategy for 60 second following a contraction
  - Nonreassuring FHR patterns in IA group were tachycardia, bradycardia, irregular rhythm, FHR <100 bpm following a UC

Maadon M 2006
Efficacy of IA

- Findings:
  - Cesarean rate was 22% in IA group and 34% in EFM group
  - No differences in maternal or neonatal adverse outcomes

Maadon M 2006

Benefits of IA

- Noninvasive technique that assures frequent contact between RN and laboring woman
- Allows FHR assessment of “the lady in the bath”
- Supports freedom of movement and ambulation
- 1:1 support associated with better outcomes independently

Efficacy of IA

- Multiple large studies and a Cochrane meta-analysis have documented positive outcomes in women who give birth at home or in free-standing birth centers give us indirect evidence that IA is both efficacious and safe

- Positive outcomes are dependent on appropriate risk screening and appropriate transfer to a hospital setting when needed


Benefits of IA

- Possible lower cesarean birth rates or at least equivalent to EFM?
- Will not detect maternal heart rate and record the maternal rate as the fetal heart rate
- Some authors say the lack of a continuous documented FHR is a medical-legal advantage
Limitations of IA

- Patient characteristics
  - Obesity or polyhydramnios may preclude use of IA
  - Lack of maternal knowledge
  - Some women prefer EFM

- IA does not allow detection of variability or allow determination of the type of deceleration that is heard

- Some women may feel IA is more intrusive

Limitations of IA

- Takes time to learn technique
- You need to adopt awkward positions sometimes
- Inability to provide 1:1 nursing
- No independent record of the FHR pattern

Interpretation of Auscultated FHR: AWHONN and ACNM

**Category 1** includes all of the following:
- FHR baseline between 110 and 160 bpm
- Regular rhythm
- Presence or absence of FHR increases or accelerations
- Absence of FHR decreases or decelerations

ACNM 2015, AWHONN 2015

**Category II** includes any of the following:
- Irregular rhythm
- Presence of gradual or abrupt recurrent decreases from the baseline
- Tachycardia (baseline >160 bpm >10 min**
- Bradycardia (baseline <110 bpm >10 min**

**FIGO states FHR <110 bpm > 160 bpm for 3 min or requires EFM**

ACNM 2015, AWHONN 2015
Interpretation of Auscultated FHR: AWHONN and ACNM

There is no **Category III** as auscultation cannot reliably detect variability

ACNM 2015, AWHONN 2015

Who is Low Risk Before Labor?

- This is from one Level 2 hospital in California:

<table>
<thead>
<tr>
<th>Low Risk Factors</th>
<th>High Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Multifetal gestation</td>
</tr>
<tr>
<td>Preterm infant (&lt;37 weeks gestation)</td>
<td>Drug or substance abuse</td>
</tr>
<tr>
<td>Post maturity (&gt;42 wks)</td>
<td>Placenta previa</td>
</tr>
<tr>
<td>Intrauterine growth restriction</td>
<td>Maternal obesity (BMI &gt;40)</td>
</tr>
<tr>
<td>Maternal smoking</td>
<td>History of preterm delivery</td>
</tr>
<tr>
<td>Maternal history of FGR</td>
<td>History of preeclampsia</td>
</tr>
<tr>
<td>Maternal history of diabetes</td>
<td>History of therapeutic abortion</td>
</tr>
</tbody>
</table>

Multi-Count Strategy Calculations

**Box 1** Example Of A Counseling Method When A Deceleration Is Auscultated

In this example, a baseline FHR has been previously established at 140 bpm. A decrease in FHR is noted while auscultating. At this point, you may start counting for consecutive 6-second intervals to confirm the presence of a deceleration and get a general picture of the depth and duration of the deceleration.

<table>
<thead>
<tr>
<th>Period</th>
<th>Baseline Count</th>
<th>Count</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-second period</td>
<td>13 beats counted</td>
<td>13 x 10 = 130 bpm</td>
<td></td>
</tr>
<tr>
<td>6-second period</td>
<td>11 beats counted</td>
<td>11 x 10 = 110 bpm</td>
<td></td>
</tr>
<tr>
<td>6-second period</td>
<td>10 beats counted</td>
<td>10 x 10 = 100 bpm</td>
<td></td>
</tr>
<tr>
<td>6-second period</td>
<td>9 beats counted</td>
<td>9 x 10 = 90 bpm</td>
<td></td>
</tr>
<tr>
<td>6-second period</td>
<td>13 beats counted</td>
<td>13 x 10 = 130 bpm</td>
<td></td>
</tr>
<tr>
<td>6-second period</td>
<td>14 beats counted</td>
<td>14 x 10 = 140 bpm</td>
<td></td>
</tr>
</tbody>
</table>

In summary, you have assessed a decrease from the baseline of 140 bpm to approximately 90 bpm and a return back to the original baseline of 140 bpm.

Note that the detailed counts described above do not need to be documented. In this case, you may use summary documentation that reflects:

- the FHR baseline rate (i.e., 140 bpm),
- the presence of a deceleration,
- further assessments and interventions initiated (e.g., position change) and
- the final response to those interventions.

Feinstein NF et al 2009