Intermittent Auscultation for Intrapartum Fetal Heart Rate Surveillance

INTRODUCTION

Standard evaluation of fetal well-being during labor includes the periodic assessment of the fetal heart rate, its pattern, and response to intrapartum stimuli and events. Effective methods of evaluation and meaningful interpretation of fetal heart rate data have long been the subjects of clinical debate. Intermittent auscultation (IA) of the fetal heart and continuous electronic fetal monitoring (EFM) are the most common methods of intrapartum fetal surveillance in current use.

Most of the professional organization recommendations for fetal heart rate assessment during labor are based upon protocols used in randomized clinical trials that compared intermittent auscultation and electronic fetal monitoring. Guidelines based on evidence-based application of intermittent auscultation during labor are not available. This clinical practice bulletin reviews intermittent auscultation and includes recommendations for use based on the best available scientific data, the need to provide informed choice, and patient safety.

INTERMITTENT AUSCULTATION

Intermittent auscultation (IA) is a method of fetal surveillance that utilizes listening and counting the fetal heart rate for a specified amount of time at specified intervals in relation to uterine contractions. IA may be done with a fetoscope, which uses bone conduction to assist in hearing the opening and closing of the valves of the fetal heart or with a hand-held Doppler ultrasound, which detects fetal heart motion and converts it to sound. Newer models of the hand-held Doppler include a paper print-out of the recorded heart rate.

Although consistent results have not emerged from the studies that have assessed the reliability and validity of IA, it appears that IA using a multiple-count strategy that assesses the fetal heart rate during and after a contraction detects the fetal heart rate, rhythm, accelerations and decelerations reliably, but does not differentiate types of decelerations or baseline variability with accuracy. Despite these limitations, all of the randomized controlled trials conducted to date confirm the equivalence of IA and EFM with respect to neonatal outcomes. Therefore, the inability to consistently determine the fetal heart rate variability or type of deceleration in labor using IA does not appear to be clinically significant when monitoring women who are at low risk for utero-placental insufficiency and who have a normal baseline rate and accelerations.

ELECTRONIC FETAL MONITORING

Electronic fetal monitoring (EFM) uses ultrasound or a fetal scalp electrode that records the fetal ECG to
produce both an auditory and visual representation of the fetal heart rate which is continuously recorded as the fetal heart rate tracing. Continuous EFM reveals baseline rate, variability, accelerations, and periodic or episodic decelerations. The presence of moderate variability, accelerations, and a normal baseline rate is highly predictive of a well oxygenated fetus. However, the interpretation of variations in the fetal heart rate pattern and rate via EFM is dependent on the reliability and validity of interpretations of the recorded data. A non-reassuring pattern has a low positive predictive value for identifying fetal acedia. Minimal or absent variability in the presence of persistent late or variable decelerations has approximately a 23%–31% positive predictive value for identifying newborn acedia. Further, there is poor inter-observer and intra-observer consistency in the interpretation of fetal heart rate patterns.

RESEARCH COMPARING IA AND EFM

Multiple randomized clinical trials designed to determine the efficacy of EFM have been performed since the adoption of EFM as the standard of care. A meta-analysis of 9 randomized trials of EFM versus IA (n = 18,561) published in 1995 concluded that there was a higher cesarean section and operative delivery rate in the EFM group with no significant difference in the number of perinatal deaths. In 2006 the Cochrane Database of Systematic Reviews published a meta-analysis of 11 randomized controlled trials that compared maternal and neonatal outcomes after continuous monitoring of the fetal heart versus intermittent auscultation during labor (greater than 33,000 women). The women in the continuous monitoring group had an increase in both cesarean section (RR 1.66, 95% CI 1.30-2.13, n = 18,761) and operative vaginal deliveries (RR 1.16, 95% CI 1.01-1.32, n = 18,515) but no difference in perinatal mortality (RR 0.85, 95% CI 0.59-1.23, n = 33,513), rates of cerebral palsy (RR 1.74, 95% CI 0.97-3.11, n = 13,252) or rates of Apgar of < 7 at five minutes (RR 0.97, 95% CI 0.72–1.31, n = 4037). There was a 50% decrease in the incidence of neonatal seizures in the continuous EFM group compared to the IA group (RR 0.50, 95% CI 0.31-0.80, n = 32,386). However, a follow-up study of the infants who had seizures at 4 years of age found an equal number of children in each group with cerebral palsy, leading the authors to conclude that continuous fetal monitoring offers little if any benefit.

In practice, the reduction in the incidence of neonatal seizures must be balanced against the morbidity associated with cesarean section and operative vaginal deliveries which significantly increases the incidence of maternal bladder injury, thrombo-embolic complications, and placenta accreta in future pregnancies. Many hospitals require EFM for a specified time on the initial admission to the labor suites. However, some investigators have noted that this requirement has not improved fetal outcome and may lead to increased intervention in labor.

METHOD OF INTERMITTENT AUSCULTATION

Most methods of IA are based on protocols used for randomized trials (Table 1). Both baseline rate and periodic changes are evaluated.

### Procedure for evaluation of fetal heart rate baseline

To determine a baseline, the fetal heart rate (FHR) is auscultated between contractions and when the fetus is not moving. At the same time the mother’s radial pulse is felt to establish that what is being heard is the fetal, not maternal, heart rate. After establishing the baseline rate, the fetal heart rate is auscultated for 15 to 60 seconds, at recommended intervals, between contractions and when the fetus is not moving, to monitor baseline changes.

### Procedure for evaluating periodic changes

Listening for accelerations and decelerations in the FHR is the second component of IA. Typically, the provider auscultates the FHR over a period of time (15 to 60 seconds) and notes any audible increase or decrease in rate. Methods have been devised to validate this information and to more accurately assess periodic changes. These studies were done on subjects who were not in labor, but the techniques can be utilized in the intrapartum setting. Most of the studies done have used a multiple-count strategy whereby the observer counts the FHR during several 5 to 15 second increments. An increase in the number obtained from each 5 or 15 second count in subsequent intervals indicates an acceleration; a decrease in the rate indicates a deceleration. These rates can be plotted on a graph for documentation as described in the work of Paine et al. If there is a question as to...
whether accelerations or decelerations have been heard, continued auscultation may provide clarification.

### The Timing of Auscultation in Relation to Contractions

The timing of auscultation varies among protocols, but can include auscultation during and after contractions. Although most recommend counting the fetal heart rate throughout a contraction and for a short time following, here also, protocols differ slightly in timing and method. One of the goals of listening throughout the contraction and for a brief time after the contraction resolves is to identify variable and late decelerations of the FHR. A Doppler with speaker and/or printer functions may have advantages over a fetoscope, including ease of use in several maternal positions and during water immersion. Audibility may allow collaboration with patients and other members of the care giving team during management decisions.

### Frequency of Intermittent Auscultation

To date there are no studies that have determined the optimal frequency of IA during labor. Current recommendations are summarized in Table 2.2–5 In the absence of evidence-based parameters to define the optimal interval for auscultation, an interval ranging between every 15 to 30 minutes during the active phase and every 5 minutes during the second stage may be reasonable as long as the auscultated FHR is reassuring and there are no other labor characteristics that would suggest a need for more frequent monitoring.

### Interpretation of the Auscultated Fetal Heart Rate

Reassuring fetal heart rate characteristics detected via IA include baseline of 110-160 beats per minute, regular rhythm, presence of accelerations, and absence of decelerations. Non-reassuring fetal heart rate characteristics include: baseline <110 or > 160 beats per minute, irregular rhythm, decelerations, and/or a baseline that steadily increases toward a tachycardic rate.17 The frequency of auscultation should be individualized based upon the contraction pattern, level of maternal activity, and institution of hydrotherapy or interventions which may influence the fetal heart rate. In addition to IA at regular intervals, it is recommended that the fetal heart be assessed before and after vaginal examinations, rupture of membranes, the administration of medication(s), or amputation.

EFM may be used to verify or clarify a fetal heart rate pattern, and guide management of non-reassuring FHR. Management of non-reassuring fetal heart rate characteristics depends on multiple factors. Intrapartum resuscitation techniques such as position change, hydration, and correction of hypotension or hyperstimulation are instituted as necessary. Continuous electronic fetal monitoring is recommended for women with maternal or fetal risk factors for adverse outcomes or acidemia. Individual practice guidelines should address these conditions.28

### DOCUMENTATION

Characteristics of the auscultated fetal heart rate that should be documented include: the counted rate (not as a range), the rhythm, and the presence or absence of accelerations or decelerations. Terms used for each characteristic should be consistent with the terminology defined by the National Institute of Child Health and Human Development Research Planning Group guidelines, where possible, which are recommended by all relevant professional associations.2,4,5,29,30 If decelerations are detected, documentation should include the nadir rate, whether the decelerations are recurrent or non-recurrent, and any interventions instituted (Appendix A). In addition, information about the labor course or maternal status which may assist in the interpretation of data by independent observers should be noted in the record. For example, the fetal heart rate response to rupture of membranes, maternal position changes, scalp stimulation, medication, or change in labor stage may indicate either a reassuring or non-reassuring fetal heart rate pattern.

### PATIENT SATISFACTION/CHOICE

In a systematic review of factors contributing to women’s satisfaction with the experience of childbirth (n=45,000), personal expectations, amount of caregiver support, quality of caregiver support, and involvement in decision making were identified as the four factors most associated with childbirth satisfaction.31 Offering low risk laboring women an informed choice about mode of fetal monitoring may further add to satisfaction with the

### Table 2. Frequency of Auscultation for Women Who are Low-Risk* During Labor

<table>
<thead>
<tr>
<th>Organization</th>
<th>Latent Phase</th>
<th>Active Phase</th>
<th>Second Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWHONN</td>
<td>15 min</td>
<td>5 min</td>
<td></td>
</tr>
<tr>
<td>ACOG</td>
<td>15 min</td>
<td>5 min</td>
<td></td>
</tr>
<tr>
<td>SOGC†</td>
<td>30 min</td>
<td>15–30 min</td>
<td>5 min</td>
</tr>
<tr>
<td>RCOG</td>
<td>15 min†</td>
<td>5 min†</td>
<td></td>
</tr>
</tbody>
</table>

AWHONN = Association of Women’s Health, Obstetric and Neonatal Nurses; ACOG = American College of Obstetricians and Gynecologists, SOGC = The Society of Obstetricians and Gynaecologists of Canada, RCOG = Royal College of Obstetricians and Gynaecologists.

*None of the professional organization guidelines 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 utero-placental insufficiency, and/or conditions that are associated with an increased incidence of UA pH of <7.1 at birth.

†Intermittent auscultation should only be used by experienced practitioners with experience in the technique of auscultation, palpation of contractions, and auditory recognition of pertinent fetal heart rate changes.

‡For a minimum of 60 seconds

Adapted from: ACOG2; Feinstein3; SOGC4 RCOG5
experience of labor and birth.32 Since IA requires 1:1 caregiving and near constant presence in order to perform auscultation at the recommended frequency, it may contribute to increased patient satisfaction.

CHALLENGES AND FUTURE RESEARCH

IA requires 1:1 care, which maybe difficult to achieve in settings where the volume of women needing attention exceeds provider capacity. More research is necessary to determine the most effective frequency of auscultation, inter-observer and intra-observer reliability, and barriers to the use of IA in labor. Studies are needed to evaluate practical methods of incorporating IA into educational programs and busy intrapartum units. Providers and students need opportunities to learn and develop comfort with the skill of intermittent auscultation.33

RECOMMENDATIONS FOR PRACTICE

Women who are at low risk for adverse neonatal outcomes at the onset of labor have similar neonatal outcomes when the fetal heart rate is monitored continuously or intermittently.13–16 IA is the preferred method of fetal surveillance in women who enter labor with no medical or obstetric conditions that are associated with utero-placental insufficiency and/or conditions that are associated with an increased risk for fetal acidemia. The frequency of observations required to monitor labor with IA facilitates other evidence-based labor support practices. Intermittent auscultation is associated with fewer cesarean sections and operative vaginal deliveries when compared to EFM, procedures which have additional attendant risks for the mother and newborn. In addition, IA allows women more mobility, which in turn increases comfort and progress of labor.23

Summary of Recommendations

1. Intermittent auscultation is the preferred method for monitoring the fetal heart rate during labor for women who at the onset of labor are low risk for developing fetal acidemia.
2. Intermittent auscultation should be conducted according to practice guidelines that include criteria for use of IA and protocols for frequency of observation and documentation.
3. Multiple-count methods are more accurate and reliable than single-count methods for evaluation of periodic changes.
4. Documentation of auscultated fetal heart rate characteristics should use approved terminology and needed descriptive notations.
5. Further research is needed to determine the reliability and validity of different IA protocols.

A literature search was conducted and articles published in English between 1986 and 2006 were reviewed. Studies were evaluated for quality using the guidelines recommended by the US Preventative Health Services Task Force in their document titled:

Guidelines for Rating Strength and Quality of Evidence from Research Findings:

Strength of Recommendation
- A: There is good evidence to support that the intervention be adopted.
- B: There is fair evidence to support that the intervention be adopted.
- C: There is insufficient evidence to recommend for or against the intervention, but recommendations may be made on other grounds.
- D: There is fair evidence to support that the intervention be excluded.
- E: There is good evidence to support that the intervention be excluded.

Quality of Evidence
- I: Evidence obtained from at least one properly randomized controlled trial.
- II-1: Evidence obtained from well-designed controlled trials without randomization.
- II-2: Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than one center or research group.
- II-3: Evidence obtained from multiple time series studies with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of the introduction of penicillin treatment in the 1940s) could also be regarded as this type of evidence.
- III: Opinions of respected authorities, based on clinical experience; descriptive studies and case reports; or reports of expert committees.

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American College of Nurse-Midwives
8403 Colesville Rd suite 1550
Silver Spring, MD 20910
www.midwife.org

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REFERENCES

## Appendix A. NICHD Terminology for Fetal Heart Rate Characteristics

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
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<tbody>
<tr>
<td>Baseline Rate</td>
<td>Mean FHR rounded to increments of 5 bpm during a 10 minute segment excluding periodic or episodic changes, periods of marked variability and, segments of baseline that differ by ≥ 25 bpm. Duration must be ≥ 2 minutes.</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>Baseline rate of &lt; 110 bpm for ≥ 10 minutes</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>Baseline rate of &gt; 160 bpm for ≥ 10 minutes</td>
</tr>
<tr>
<td>Variability</td>
<td>Fluctuations in the baseline FHR of 2 cycles/min or greater. Visually quantitated as the amplitude of the peak-to-trough in beats per minute</td>
</tr>
<tr>
<td>- Absent variability</td>
<td>Amplitude from peak to trough undetectable.</td>
</tr>
<tr>
<td>- Minimal variability</td>
<td>Amplitude from peak to trough &gt; undetectable and ≤ 5 bpm.</td>
</tr>
<tr>
<td>- Moderate variability</td>
<td>Amplitude from peak to trough 6-25 bpm.</td>
</tr>
<tr>
<td>- Marked variability</td>
<td>Amplitude from peak to trough &gt; 25 bpm.</td>
</tr>
<tr>
<td>Acceleration</td>
<td>Visually apparent abrupt increase (onset to peak is &lt; 30 sec.) of FHR above baseline. Peak is ≥ 15 bpm. Duration is ≥ 15 bpm and &lt; 2 min. In gestations &lt; 32 weeks, Peak of 10 bpm and duration of 10 sec. is acceleration.</td>
</tr>
<tr>
<td>Prolonged acceleration</td>
<td>Acceleration &gt; 2 min and &lt; 10 min duration.</td>
</tr>
<tr>
<td>Early deceleration</td>
<td>Visually apparent gradual decrease (onset to nadir is ≥ 30 sec.) of FHR below baseline. Return to baseline associated with a uterine contraction. Nadir of deceleration occurs at the same time as the peak of the contraction. Generally, the onset, nadir, and recovery of the deceleration occur at the same time as the onset, peak and recovery of the contraction.</td>
</tr>
<tr>
<td>Late deceleration</td>
<td>Visually apparent gradual decrease (onset to nadir is ≥ 30 sec.) of FHR below baseline. Return to baseline associated with a uterine contraction. Nadir of deceleration occurs after the peak of the contraction. Generally, the onset, nadir and recovery of the deceleration occur after same time as the onset, peak, and recovery of the contraction</td>
</tr>
<tr>
<td>Variable deceleration</td>
<td>Visually apparent abrupt decrease (onset to nadir is &lt; 30 sec.) in FHR below baseline. Decrease is ≥ 15 bpm. Duration is ≥ 15 sec. and &lt; 2 min.</td>
</tr>
<tr>
<td>Prolonged deceleration</td>
<td>Visually apparent abrupt decrease (onset to nadir is &lt; 30 sec.) in FHR below baseline. Decrease is ≥ 15 bpm. Duration is ≥ 2 min. but &lt; 10 min.</td>
</tr>
</tbody>
</table>