

Fetal Heart Rate Auscultation, 3rd edition

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MESH Terms

Auscultation
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Cesarean Section

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ABSTRACT

The use of intermittent auscultation (IA) for fetal surveillance during labor decreased with the introduction of electronic fetal monitoring (EFM). The increased use of EFM is associated with an increase in cesarean births. IA is an evidence-based method of fetal surveillance during labor for women with low risk pregnancies and considered one component of comprehensive efforts to reduce the primary cesarean rate and promote vaginal birth. Many clinicians are not familiar with IA practice. This practice monograph includes information on IA techniques; interpretation and documentation; clinical decision-making and interventions; communication; education, staffing, legal issues, and strategies to promote implementation of IA into practice.

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Introduction

Intermittent auscultation (IA) is a primary method of fetal surveillance in labor. It is the practice of using a device, most commonly a handheld Doppler device or fetoscope, for periodic assessment of the fetal heart rate (FHR) during labor in conjunction with manual palpation to assess uterine contractions (Wisner, 2015). In the third edition of this practice monograph, the literature to date regarding the use of IA is summarized and information is provided regarding the incorporation of IA into intrapartum clinical practice. Topics include IA techniques; interpretation and documentation; clinical decision-making and interventions; communication; education, staffing, and legal issues; and considerations for future practice and research. We direct the reader to AWHONN's *Fetal Heart Monitoring Principles and Practices*, fifth edition (O'Brien-Abel, 2015), for a full discussion of the physiologic basis of fetal heart monitoring (FHM). Evidence-based recommendations regarding the use of IA are provided where possible. Contextual considerations are discussed throughout the monograph. The information provided in the monograph should be used and interpreted in conjunction with existing institutional policies and procedures and within state and national practice guidelines.

Review of the Literature

History and Background

While external and internal electronic fetal monitoring (EFM) are currently in much greater use than IA, this was not always the case. EFM, also known as cardiotocography (CTG), denotes the simultaneous electronic monitoring of FHR and uterine contractions.

Historically, assessment of the FHR began with placing an ear on the pregnant woman's abdomen; progressed to use of the stethoscope, fetoscope, or handheld Doppler device for IA; and eventually transitioned to the use of EFM (Goodlin, 1979).

When EFM was introduced in the United States in the 1960s, the capacity to capture a record of continuous FHR data made EFM seem intuitively superior to the intermittent IA data collected by skilled practitioners. It was theorized, for example, that the use of continuous EFM could prevent fetal deaths and decrease the incidence of cerebral palsy (Greene, 2006; Hersh, Megregian, & Emeis, 2014; Neilson, 1994c). Over time, the increasing availability of EFM resulted in decreased use or elimination of IA for fetal surveillance (McCartney, 2015). An accompanying decline in familiarity with IA techniques further marginalized IA as a method of EFM. In many settings, practitioners' experience and comfort level with IA technique may remain a barrier to use (Hersh et al., 2014).

Routine use of EFM has been linked to increases in operative vaginal birth and cesarean birth rates without an accompanying decrease in perinatal mortality or the incidence of childhood morbidity (Alfirevic, Devane, & Gyte, 2013; Killion, 2015). The increasing rate of cesarean births can increase maternal mortality and morbidity, such as an immediate risk of hemorrhage or a delayed risk of morbidly adherent placenta in future pregnancies (American College of Obstetricians and Gynecologists [ACOG], 2014; Main et al., 2012). Increasing the availability and use of IA for fetal surveillance in labor in women with low-risk pregnancies is recommended as one component of comprehensive efforts to reduce

the primary cesarean rate and promote vaginal birth (Cox & King, 2015). For example, increased use of IA is a featured strategy in the California Maternal Quality Care Collaborative (CMQCC) Toolkit to Support Vaginal Birth and Reduce Primary Cesareans (Smith, Peterson, Lagrew, & Main, 2016).

Prevalence of Intermittent Auscultation and Electronic Fetal Monitoring Techniques for Fetal Surveillance in the United States

Today, EFM is the routine method of fetal surveillance in most U.S. intrapartum care settings (ACOG, 2009; Stout & Cahill, 2011). By contrast, in the 1980s about 62% of U.S. women had EFM (Albers & Krulwich, 1993). By 1992, EFM was used in nearly 75% of labors (Thacker, Stroup, & Peterson, 1998). The use of EFM during labor increased from 83% of live births for women in the 1990s (Haggerty, 1999; Ventura, Martin, Curtin, & Matthews, 1998) to more than 90% of laboring women in the 2000s (Declercq, Sakala, Corry, Applebaum, & Herrlich, 2013a; Liston, Sawchuck, & Young, 2018). In a 2013 survey, 23% of U.S. laboring women reported that IA was used in combination with intermittent or continuous EFM during their labor. Of the 89% of women who reported some EFM use during their labors, 80% reported that EFM was continuous or used “most of the time” (p. 85; Declercq, Sakala, Corry, Applebaum, & Herrlich, 2013b).

Effectiveness of Intermittent Auscultation and Electronic Fetal Monitoring Surveillance Techniques

The rapid increase in the rate of EFM use initially exceeded the pace at which the effectiveness of the new technology could be gauged (Heelan, 2013). The first clinical trials to compare EFM to IA in low-risk births showed no significant benefit to the technology, which increased skepticism among some providers (Banta & Thacker, 2001). Twelve randomized clinical trials (RCTs) published between 1976 and 1994 and subsequent meta-analyses also failed to demonstrate significant benefit to EFM when compared to IA (Alfirevic, Devane, & Gyte, 2006; Anderson, 1994; Grant, 1992; Neilson, 1994a, 1994b, 1994c; Thacker, Stroup, & Peterson, 1995, 1998; Thacker, Stroup, & Chang, 2006; Vintzileos et al., 1995; please see Appendix A for a review of the foundational literature underpinning current IA practice). While studies seem to show that IA cannot be used to reliably differentiate between types of decelerations or identify moderate heart rate variability, it appears that when correctly used, IA is equivalent to EFM in determining long-term neonatal outcomes (American College of Nurse-Midwives [ACNM], 2015; Alfirevic, Devane, Gyte, & Cuthbert, 2017). The presence of moderate variability, only assessed by EFM, has been considered a reliable indicator of the absence of fetal metabolic acidemia at the time it is observed (Macones, Hankins, Spong, Hauth, & Moore, 2008). However, it has recently been suggested that moderate variability may not be completely reliable to rule out fetal metabolic acidemia (Cahill, Roehl, Odibo, & Macones, 2012; Clark et al., 2017; Kiely, 2018).

Some research has shown limited benefits to EFM in detecting fetal acidemia (Parer, King, Flanders, Fox, & Kilpatrick, 2006) and

cord blood metabolic acidosis (Elliott, Warrick, Graham, & Hamilton, 2010). Other studies have shown a slightly higher risk for neonatal seizures in the first 48 hours of life for newborns whose mothers received IA (Thacker et al., 1995). In further reviews, researchers concluded that although intrapartum EFM abnormalities have been correlated with umbilical cord base excess and decreased neonatal seizures, there is no effect on perinatal mortality or pediatric neurologic morbidity (Graham, Petersen, Christo, & Fox, 2006). Additionally, the use of EFM upon labor admission, when compared with IA, increased the risk of cesarean and operative vaginal birth in women with low-risk pregnancies (Gourounti & Sandall, 2007). Finally, Graham and colleagues (2014) studied the EFM tracings of 39 newborns diagnosed with neonatal hypoxic-ischemic encephalopathy (HIE) compared to tracings of 78 control newborns with no HIE. The EFM tracings during the hour before birth had no specific abnormalities predictive of HIE, which may suggest EFM to be poorly predictive of neonatal HIE.

In several Cochrane meta-analyses of RCTs in the United States, Europe, and Australia, researchers have consistently found lower rates of neonatal seizures with routine EFM when compared to IA (Alfirevic et al., 2013; Alfirevic et al., 2017; Devane, Lalor, Daly, McGuire, & Smith, 2012; Devane et al., 2017; Grant, 1992; Neilson, 1994a, 1994b, 2015; Thacker, Stroup, & Chang, 2001). However, none of the Cochrane reviews indicated differences in admissions to the NICU, perinatal deaths, or cerebral palsy. Subgroup analyses (of low-risk and high-risk pregnancies, preterm births, and high-quality trials) showed similar overall findings. The Cochrane reviews have also consistently illustrated an increased rate of cesarean and operative vaginal births with EFM. Fetal blood sampling and fetal pulse oximetry were proposed as adjunct strategies that might enhance the efficacy of EFM in assessing fetal response to labor and help reduce the cesarean birth rate (Grant, 1992; Neilson, 1994b, 1994c). In a 2014 Cochrane review, pulse oximetry was also found not to decrease the overall rate of cesarean births when used with EFM (East, Begg, Colditz, & Lau, 2014).

On the basis of the available evidence, professional associations have stated that IA and EFM are considered acceptable methods of fetal surveillance during active labor for women without complications (ACNM, 2015; American Academy of Pediatrics [AAP] & ACOG, 2017; ACOG, 2009; AWHONN, 2018b).

Translating Research Into Practice

Facilitators to promote implementation of IA include strong interprofessional leadership in support of IA guidelines, inclusion of the staff in decision-making, education on the use of IA, and the presence of midwives and senior nurses on the unit who are comfortable using IA (Graham et al., 2014; Heelan, 2013; Hersh et al., 2014; Smith, 2017; Snelgrove-Clarke & Scott-Findlay, 2005). Commonly cited barriers to implementation of IA for low-risk labor include medicolegal concerns; lack of medical or administrative support; lack of adequate numbers of Doppler devices; the presence of an EFM in most labor rooms; limited financial resources and staff; the need to educate or re-educate nurses on the use of IA; and the

reluctance to give up the comfort level associated with the use of EFM, which includes a record that can be retrieved and reviewed (Graham et al., 2014; Greene, 2006; Haggerty, 1999; Heelan, 2013; Hersh et al., 2014; Hindley, Hinshiff, & Thomson, 2006; Klein et al., 2006; Maude, Skinner, & Foureur, 2014; Miller, 2015; Morrison et al., 1993; Parer, 2003; Patey et al., 2017; Simpson, 2005; Supplee & Vezeau, 1996; Wood, 2003).

There is a continuing need for greater understanding of the complex factors involved in the decision-making process of women and their providers as they consider which type of monitoring to use during labor (Heelan, 2013; Hersh et al., 2014; Parer, 2003; Wood, 2003) and the optimum strategies for promoting translation of best evidence into practice. The potential lack of maternal knowledge and proper informed consent regarding monitoring methods may contribute to the use of EFM versus IA (Haggerty, 1999; Heelan, 2013; Hersh et al., 2014; Maude et al., 2014; Miller, 2015; Wood, 2003). A recent content analysis found that consumer-oriented childbirth education sources gave incomplete and confusing information regarding fetal surveillance options in labor and presented EFM as the standard of care, and one third of sources reviewed did not mention IA (Torres, De Vries, & Low, 2014). Although it has been hypothesized that women may prefer the comfort of hearing the FHR with EFM during labor (Parer, 2003), there is a lack of research on women's preferences (Priddy, 2004; Wood, 2003). Authors of several Cochrane meta-analyses of RCTs in the United States, Europe, and Australia recommend that decisions about mode of monitoring should be made jointly by the woman and her family and their health care provider (Alfirevic et al., 2013; Alfirevic et al., 2017; Devane et al., 2017; Devane et al., 2012; Grant, 1992; Neilson, 1994a, 1994b, 2015; Thacker et al., 2001).

Auscultation Devices

There are several listening devices available to perform IA. These fall into two categories: variations of the stethoscope that allow the clinician to hear the actual fetal heart sounds and devices with ultrasound technology that indirectly detects the FHR (Martis, Emilia, Nurdianti, & Brown, 2017).

Stethoscope Devices

Stethoscope devices include the standard stethoscope and fetoscopes that were developed specifically to auscultate the fetal heart. While rarely used in developed countries, a stethoscope used to auscultate heart, lung, or bowel sounds can be used to listen to the fetal heart. The Pinard fetoscope, named after a French physician credited with its development, is a monaural (one ear), trumpet-shaped device that is used to directly hear the opening and closing of the fetal ventricular heart valves (Maude, Lawson, & Foureur, 2010). Sometimes called a Pinard horn, the device's larger end is placed on the maternal abdomen and smaller end to the clinician's ear (Martis et al., 2017). Also named after its developers, the DeLee-Hillis fetoscope is a binaural (both ears) device consisting of a stethoscope combined with a fetoscope, similar to the Pinard. The smaller end of

the fetoscope is placed on the clinician's forehead instead of the ear, often secured via a metal headband, and bone conduction augments and transmits sound (Martis et al., 2017).

Ultrasound Devices

Handheld Doppler devices generate an audible FHR by bouncing sound waves off the fetal cardiac structures and converting that into sound (Martis et al., 2017). They come in various sizes and are available with features such as the ability to be submerged in water and a screen to display the FHR. The transducer from an EFM machine, which also uses ultrasound technology, is sometimes used instead of a Doppler device to auscultate the FHR intermittently. Clinicians should be encouraged to use other listening devices (e.g., Doppler device, fetoscope) when available. Clinicians should be aware that some EFM systems automatically archive data, even when the paper tracing is turned off, although the EFM data generated would be too brief to be interpretable.

Intermittent EFM. The CMQCC has included intermittent EFM in their toolkit to support vaginal birth (Smith et al., 2016). While the authors support the use of IA with a handheld device, they have suggested that using EFM equipment to perform intermittent monitoring may facilitate its use in settings where there is a reluctance to implement IA (Smith et al., 2016; Smith, 2017). Smith (2017) has suggested that clinician familiarity with EFM and having EFM equipment in every room may enhance adoption of intermittent monitoring in "high-intervention" settings. The suggested method involves obtaining a 3–5 minute EFM tracing using both the tocodynamometer and ultrasound transducers, intentionally assessing before, during, and 1 minute after a contraction at the same specified intervals as IA (Smith, 2017). Only one study has compared outcomes between intermittent EFM and IA using a Doppler-type device or a Pinard stethoscope (Mahomed, Nvoni, Mulambo, Kasule, & Jacobus, 1994). Findings from this study should be applied with caution because of methodological concerns (Martis et al., 2017) and considerable differences in the intermittent EFM protocol used in this study and the one described by CMQCC (Mahomed et al., 1994; Smith, 2017). While the strategy proposed by CMQCC (Smith et al., 2016; Smith, 2017) may make some of the benefits of IA accessible in a larger range of settings, more high-quality studies are needed to understand the relative impact of alternative intermittent protocols.

Benefits and Limitations of Auscultation Devices

In a 2017 review, researchers compared fetal and maternal outcomes in women monitored using a Pinard stethoscope, handheld Doppler device, and intermittent monitoring with an EFM ultrasound transducer (Martis et al., 2017). The review was limited to three studies from Africa, and findings suggested that the use of intermittent EFM with a transducer, handheld Doppler, and intensive Pinard stethoscope led to increased detection of abnormal FHR patterns, such as bradycardia and tachycardia, compared to standard Pinard (Martis et al., 2017). The handheld Doppler and intermittent EFM detected more early and late FHR decelerations

TABLE 1 FETAL HEART RATE CHARACTERISTICS DETERMINED VIA AUSCULTATION VERSUS ELECTRONIC MONITOR

FHR Characteristic ^a	Fetoscope	Doppler Device Without Paper Printout	Electronic FHR Monitor
Variability	No	No	Yes
Baseline rate	Yes	Yes	Yes
Accelerations	Detects increases ^b	Detects increases ^b	Yes
Decelerations	Detects decreases	Detects decreases	Differentiates types of decelerations
Rhythm ^c	Yes	Yes	Yes
Double counting or half-counting FHR	Can clarify	May double count or half count	May double count or half count
Differentiation of maternal and fetal heart rate	Yes	May detect maternal heart rate	May detect and record maternal heart rate

Note. From "Intermittent Auscultation for Intrapartum Fetal Heart Rate Surveillance," by American College of Nurse Midwives, *Journal of Midwifery & Women's Health*, 60, p. 627. Copyright 2015 by the American College of Nurse Midwives. Used with permission. FHR = fetal heart rate.

^aDefinitions of each FHR characteristic based on those reported in Macones et al.²⁰

^bPer method described by Paine et al.¹² and Paine et al.¹³

^cDetermined as regular or irregular. None of these devices can diagnose the type of fetal arrhythmia.

than the Pinard, and women monitored via Doppler had higher rates of cesarean birth than those monitored with a Pinard (Martis et al., 2017). A study in rural Tanzania evaluated the frequency of abnormal FHR detection and adverse perinatal outcomes between women who were monitored intermittently using a Doppler device and fetoscope and found no statistically significant differences between the two groups (Mdoe et al., 2018).

Devices using ultrasound technology such as the Doppler device or EFM transducer may detect an irregular rhythm, but only a fetoscope can confirm an irregular rhythm. This is because the fetoscope allows the practitioner to hear the actual heart sounds associated with the opening and closing of ventricular valves in the fetal heart. Ultrasound devices may detect blood flow through the placenta or cord, which represents maternal heart rate instead of FHR; hence, the maternal pulse should be checked when auscultating using ultrasound technology to differentiate maternal heart rate from FHR. Finally, ultrasound devices are subject to double- and half-counting, presumably when the FHR approaches the lower and upper thresholds, respectively, for accurate FHR detection (Ayres-de-Campos, Spong, Chandrachan, & FIGO Intrapartum Fetal Monitoring Expert Consensus Panel, 2015). Half-counting may occur at FHRs above 210 bpm and double-counting with FHRs below 50 bpm. A fetoscope should be used to clarify the FHR.

Reported limitations of the fetoscope include maternal discomfort from the abdominal pressure often required to hear the FHR and difficulty hearing fetal heart tones during a contraction because of the sustained contact required (Blake, 2008; see Table 1).

Auscultation Procedure

No studies have compared outcomes using different auscultation protocols. Various methods have been recommended by professional organizations (ACNM, 2015; Lewis, Downe, & FIGO Intrapartum

Fetal Monitoring Expert Consensus Panel, 2015; Liston et al., 2018), and these are typically modeled after protocols used in RCTs comparing EFM to IA. Methods have included listening to the FHR in between contractions to determine the FHR baseline and then auscultating for at least 30 seconds after a contraction (Kelso et al., 1978; Luthy et al., 1987; Mahomed et al., 1994; Morrison et al., 1993; Shy et al., 1990), auscultating during/after a contraction only (Haverkamp, Thompson, McFee, & Cetrulo, 1976; Haverkamp et al., 1979), or auscultating for 60 seconds at specified intervals (MacDonald, Grant, Sheridan-Pereira, Boylan, & Chalmers, 1985; Vintzileos et al., 1993).

Researchers have evaluated the accuracy of palpation of uterine contractions by comparing clinician estimates with intrauterine pressure readings. Caldeyro-Barcia and Poseiro (1960) found that clinicians underestimated contraction duration and overestimated the resting period between contractions when using palpation. Arrabal and Nagey (1996) reported that clinicians were accurate about half of the time in estimating contraction intensity as mild, moderate, and strong using palpation compared to intrauterine pressure readings. While it is important to understand the accuracy of palpation techniques, there are no data suggesting that quantification of the uterine activity with internal monitoring results in improved perinatal outcomes (Arrabal & Nagey, 1996; see Figure 1).

Researchers have also compared clinicians' accuracy in interpreting auscultated FHR characteristics to tracings obtained via external or internal fetal monitoring devices and found that clinicians accurately assessed FHR baseline (Miller, Pearse, & Paul, 1984; Strong & Jarles, 1993), FHR accelerations (Miller et al., 1984; O'Leary, Mendenhall, & Andrinopoulos, 1980; Paine, Payton, & Johnson, 1986), the presence of decelerations (Miller et al., 1984), and the duration and nadir of decelerations (Strong & Jarles, 1993). Clinicians were less accurate in detecting variability and salutatory patterns (Miller et al., 1984); however, there is professional consensus that accurate detection of FHR

variability, categorization of the types of decelerations, and any Category III patterns (such as a salutatory pattern) all require visual interpretation and therefore cannot be assessed using IA (Macones et al., 2008).

The IA method includes manual palpation to assess fetal lie and uterine activity and auscultation of the FHR with a fetoscope or Doppler device. Abdominal palpation is used to assess the resting tone of the uterus in between contractions and contraction characteristics, such as frequency, duration, and intensity. A clinician may use Leopold's maneuvers to help assess fetal lie in order to identify the optimal location for auscultating the FHR.

Leopold's Maneuvers

Leopold's maneuvers include four steps to determine fetal lie, presentation, position, and the optimal location for placement of the auscultation device (see Figure 2; King, Brucker, Osborne, & Jevitt, 2019). Before starting, ask the woman if she would like to void. Then, assist her to a comfortable position lying supine with her knees slightly flexed to decrease lower abdominal muscle tension and in a lateral tilt to avoid hypotension. Next, visually inspect the abdomen for overall shape and size. Use the flat palmar surfaces of the hands, with the fingers together, to gently but firmly palpate the uterus.

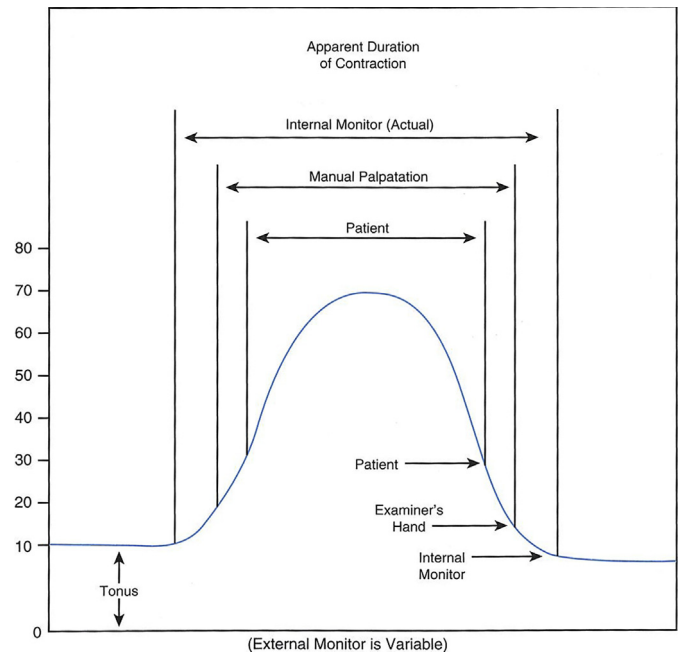
First maneuver. Determine the fetal part in the fundus by standing at the woman's side, facing her, and palpating the upper part of the uterus. The buttocks will likely feel firm and immobile, whereas the head will feel round, hard, and ballotable.

Second maneuver. Locate the fetal back by placing one hand on one side of the abdomen to stabilize the fetus and the other hand on the opposite side to identify fetal parts. The fetus's back will feel smooth, firm, and consistent. The front of the body will feel smaller, irregular, protruding, and knobby as fetal arms, hands, legs, and feet are located. This maneuver may be done in a stepwise fashion, beginning at the fundus, moving the palpating hand from the center of the abdomen toward the woman's back, on one side and then the opposite side, moving down the uterus to the symphysis pubis. This technique may be particularly helpful when the fetal position is directly occiput anterior or posterior.

Third maneuver. This is used to confirm the position and mobility of the fetal presenting part. While facing the woman, place the finger(s) and the thumb of one hand pointing upward toward the woman's head and just above the symphysis pubis to grasp the part of the fetus situated there. Use firm, gentle pressure to determine the presenting part, while the other hand may be placed on the fundus to confirm findings. If the presenting part moves upward, it is considered not engaged. This maneuver, also called the Pallach's grip, should confirm what was felt during the first maneuver.

Fourth maneuver. Determine fetal attitude in a cephalic presentation by turning to face the woman's feet and placing both hands on either side of her uterus; then, move the hands toward the pelvic brim. Only a small portion of the head will be palpable if fully

FIGURE 1 COMPARISON OF UTERINE CONTRACTION ASSESSMENT BY PALPATION, EXTERNAL TOCODYNAMOMETER, AND INTRAUTERINE PRESSURE CATHETER



Note. From *Fetal Heart Rate Monitoring* (4th ed., p. 87) by R. K. Freeman, T. J. Garite, M. P. Nageotte, and L. A. Miller, 2012, Philadelphia, PA: Lippincott Williams & Wilkins. Copyright 2012 by Lippincott Williams & Wilkins. Reprinted with permission.

engaged. If the cephalic prominence or brow is felt on the same side as the fetal parts, the head is flexed; if the cephalic prominence is felt on the same side as the back, the head is extended.

Intermittent Auscultation Technique

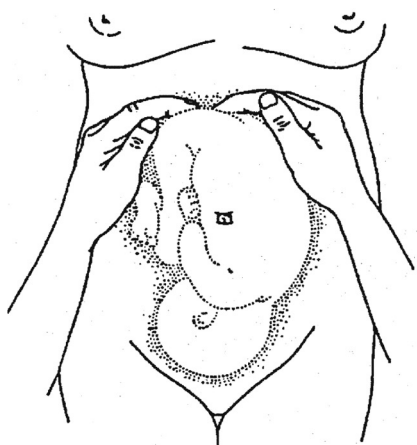
Uterine Activity Assessment

The onset, duration, frequency, and intensity of the uterine contractions are assessed by manual palpation. The frequency is noted in minutes from the beginning of one contraction to the beginning of the next, and duration is quantified in seconds rounded to 10-second increments. Assessment of contraction intensity is performed using the more sensitive fingertip pads (as opposed to the palms) over the uterine fundus as the uterine wall contracts and rises upward. Record intensity as mild, moderate, or strong according to the ability to indent the uterus. Uterine resting tone is assessed between contractions and expressed as soft or firm (Wisner & Ali, 2015; see Table 2).

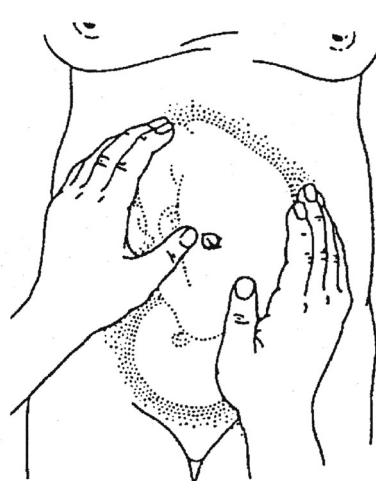
FHR Assessment

The auscultation technique outlined in this section includes assessing the FHR baseline between contractions and assessing for periodic changes of the FHR by listening during the latter part of a

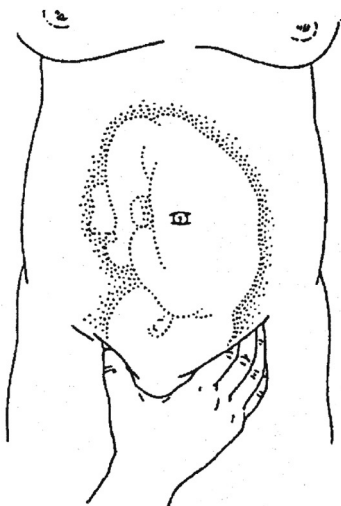
FIGURE 2 LEOPOLD'S MANEUVERS



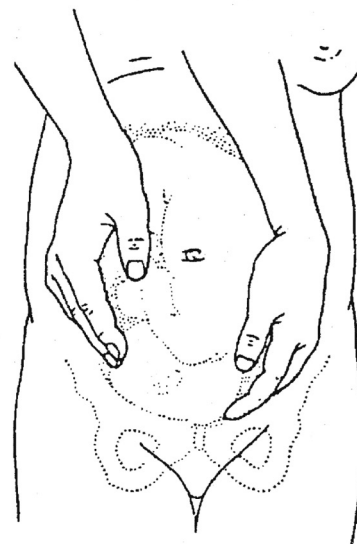
1st Maneuver
Assess part of fetus
in the upper uterus



2nd Maneuver
Assess location
of the fetal back



3rd Maneuver
Identify presenting part



4th Maneuver
Determine the descent
of the presenting part

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contraction and for 30 seconds afterward at each specified assessment interval. The recommended technique is described below.

FHR baseline. Once uterine activity and fetal lie have been assessed, the next step is to listen to the FHR. The bell of the

fetoscope or the Doppler probe is placed over the fetal back, and the examiner listens to the FHR between uterine contractions and when the fetus is not moving to establish an FHR baseline using a single-count strategy. Once determined, the FHR baseline should be assessed at recommended intervals. The single-count method involves listening to the FHR for 30–60 seconds, between

TABLE 2 COMPARISON MODEL FOR PALPATION OF UTERINE ACTIVITY

Palpation of Uterus	Feels Like...	Contraction Intensity
Easily indented	Tip of nose	Mild
Can slightly indent	Chin	Moderate
Cannot indent	Forehead	Strong

Note. Contractions should be referred to using one of the above descriptive terms—mild, moderate, or strong—rather than labeled as “good” or “satisfactory.” Source: Malinowski, Pedigo, & Phillips (1989).

contractions, and documenting the FHR baseline as a single number (see Table 3 for description of the complete auscultation procedure).

Periodic changes. The next step is to auscultate for periodic changes of the FHR such as variable or late decelerations. While listening to the FHR during a contraction may be challenging because of maternal movement and vocal expression, experts recommend listening during the last part of a contraction and for at least 15–30 seconds after the contraction ends to identify any associated decelerations (ACNM, 2015). Only the presence or absence of decelerations can be assessed and documented when using IA, since the classification of decelerations as early, variable, late, or prolonged requires visual interpretation. When decelerations are identified, the nadir rate and whether they are recurrent or non-recurrent should also be documented (ACNM, 2015).

Most RCTs comparing EFM and IA used a single-count strategy and assessed baseline between uterine contractions and/or auscultated during and after a contraction; hence, there are limited data to support adjunctive techniques. However, a multicount strategy has been suggested as an alternative to the single-count method.

Multicount method. A multicount strategy was used in a series of studies in which researchers sought to assess interobserver reliability of auscultated FHR accelerations (Paine, Payton, & Johnson, 1986) and to propose and test an auscultated nonstress test as an alternative to a nonstress test obtained via EFM (Paine, Johnson, Turner, & Payton, 1986; Paine, Johnson, & Alexander, 1988). This counting method involved auscultating the FHR continuously for 3–6 minutes and recording findings

TABLE 3 AUSCULTATION PROCEDURE

Procedure	Rationale
1. Explain the procedure to the woman and her support person(s).	1. Allays fears and anxiety; offers opportunity for emotional and informational support.
2. Assist the woman to a semi-Fowler's or wedged lateral position.	2. Prevents supine hypotension syndrome and promotes comfort.
3. Palpate the maternal abdomen and perform Leopold's maneuvers.	3. Locates the fetal vertex, buttocks, and back and determines the best location for auscultation (fetal heart sounds are best heard through the fetal back).
4. Assess uterine contractions (frequency, duration, intensity) and uterine resting tone by palpation.	4. Determines uterine activity.
5. Apply conduction gel to underside of the Doppler device, if used.	5. Provides an airtight seal and aids in the transmission of ultrasound waves.
6. Position the bell of fetoscope or Doppler device on the area of maximum intensity of the fetal heart sounds (usually over the fetal back). Use firm pressure if using the fetoscope.	6. Obtains the strongest FHR signal.
7. Place a finger on woman's radial pulse if using a Doppler device or ultrasound transducer.	7. Differentiates maternal heart rate from FHR.
8. Determine FHR baseline by listening between contractions for at least 30 seconds.	8. Identifies the baseline FHR (in bpm), the rhythm (regular or irregular), and the presence or absence of FHR accelerations or decelerations.
9. Assess the FHR for the latter part of a contraction and <i>after</i> uterine contractions for at least 15–30 seconds to detect periodic changes.	9. Clarifies the presence of FHR changes. Clarifies the nature of FHR changes, such as abrupt versus gradual changes, and amplitude.
10. A multicount strategy may be used to detect FHR accelerations. This method has not been validated for detecting decelerations.	10. May be used as an adjunctive technique to assess for FHR accelerations.

Note. From “Techniques for Fetal Heart and Uterine Activity Assessment,” by M. M. Killion, in *Fetal Heart Monitoring Principles and Practices* (5th ed., p. 90), edited by A. Lyndon and L. U. Ali, 2015, Washington, DC: Association of Women's Health, Obstetric and Neonatal Nursing. Copyright 2015 by the Association of Women's Health, Obstetric and Neonatal Nurses. Adapted with permission.

TABLE 4 ASSESSMENT AND DOCUMENTATION OF FETAL STATUS USING INTERMITTENT AUSCULTATION^{a,b}

	Latent phase (< 4 cm)	Latent phase (4–5 cm)	Active phase (≥ 6 cm)	Second stage (passive fetal descent)	Second stage (active pushing)
Low risk without oxytocin	Insufficient evidence to make a recommendation. Frequency at the discretion of the midwife or physician.	Every 15–30 minutes	Every 15–30 minutes	Every 15 minutes	Every 5–15 minutes

Note. From “Fetal Heart Monitoring,” by the Association of Women’s Health, Obstetric and Neonatal Nurses, 2018, *Nursing for Women’s Health*, 22, p. 507. Copyright 2018 by the Association of Women’s Health, Obstetric and Neonatal Nurses.

^aFrequency of assessment should always be determined based on the status of the mother and fetus and at times will need to occur more often based on their clinical needs, e.g., in response to a temporary or ongoing change.

^bSummary documentation is acceptable, and individual hospital policy should be followed.

obtained from every other 5-second auscultation period (Paine, Payton, & Johnson, 1986; Paine, Johnson, et al., 1986). The findings were plotted on a graph to simulate an FHR tracing. This method was found to accurately assess FHR accelerations when compared to an FHR tracing obtained simultaneously via EFM. Schiffrin, Amsel, and Burdorf (1992) applied a multicount algorithm using computer simulation that obtained three 10-second counts, each separated by 5 seconds, and compared this to a single-count method to detect FHR decelerations. While their findings suggested that the multicount strategy was more accurate than a single-count method, no further studies were found that support the use of a multicount method to detect FHR decelerations, and this has not been evaluated in vivo. More research is needed to compare outcomes using the various counting methods in the intrapartum period.

Frequency of Auscultation

Institutions should develop policies surrounding FHM, with specific guidance about the criteria required for use of IA or EFM and the frequency and documentation of assessments according to stage of labor, risk factors, and clinical findings (AAP & ACOG, 2017). Most professional organizations recommend evaluating the FHR and contractions in low-risk women every 15–30 minutes in active labor and at least every 15 minutes in the second stage of labor (AAP & ACOG, 2017; ACNM, 2015; AWHONN, 2018b). AWHONN recommendations include distinguishing between passive descent and active pushing during the second stage of labor when determining frequency intervals for assessment (AWHONN, 2018b; see Table 4). The FHR should also be assessed after rupture of membranes, maternal position changes, scalp stimulation, or vaginal examination (ACNM, 2015).

Auscultation in Specific Clinical Situations

Factors to be considered when choosing the appropriate FHM method include maternal preference, clinical judgment, maternal-fetal assessment, and any potential risks. IA is an acceptable method of fetal assessment for women with low-risk pregnancies who are in labor (AAP & ACOG, 2017; ACNM, 2010; ACOG, 2017a; AWHONN, 2018b). Low risk has been defined in this context to include healthy women without complications (ACNM,

2010; Heelan, 2013), specifically women who have no meconium staining, intrapartum bleeding, or undetermined/abnormal fetal test results; no maternal diagnoses or factors that could affect fetal response to labor; no known factors that could increase risk of fetal acidemia during labor, such as uteroplacental insufficiency; and who are not undergoing cervical ripening, oxytocin augmentation, induction, or trial of labor after cesarean (ACOG, 2017a; 2017b). However, there is debate with regard to obtaining an EFM tracing on admission before starting IA and during regional analgesia.

Admission Assessment

An EFM tracing on admission, generally a 20-minute tracing, to evaluate the fetal tolerance to labor is a practice that may be used in some settings. In a 2017 Cochrane review, Devane and colleagues recommend that an admission EFM not be used for women in labor who are low risk on admission. Admission EFM assessment does not improve neonatal outcomes and may lead to increased interventions such as cesarean birth (Devane et al., 2017). The reviewed studies that compare IA to EFM for admission assessment are limited; the quality of evidence in these studies is rated as very low to moderate, and more research is needed (Devane et al., 2017). Given the general agreement that IA is an appropriate method of fetal assessment for women with low-risk pregnancies, it is reasonable to extend support of the IA method to the initial admission assessment and offer this choice to women presenting in labor (Blix, 2013).

Regional Analgesia

There is limited evidence and guidance supporting a particular method of FHM for women receiving regional analgesia (ACOG, 2017c). The American Society of Anesthesiologists (2016) states that continuous monitoring of the FHR may not be necessary or possible in all situations. Two professional organizations outside the United States have published guidelines that include support for the use of IA surrounding regional analgesia (Liston et al., 2018; National Institute for Health and Care Excellence [NICE], 2017). The NICE (2017) guideline recommends continuous EFM for at least 30 minutes during initiation of regional analgesia and after any bolus of 10 ml or more. Note that they also recommend a low-dose solution for regional analgesia of 10–15 ml of 0.0625–0.1%

TABLE 5 FHR AND UTERINE CHARACTERISTICS ASSESSED USING IA

FHR	Uterine
Baseline characteristics • Baseline rate • Baseline rhythm • Baseline changes	Uterine activity • Frequency • Duration • Intensity • Resting tone
• Presence or absence of accelerations • Presence or absence of decelerations	

bupivacaine with 1–2 mcg per ml fentanyl. The guideline from the Society of Obstetricians and Gynaecologists of Canada (Liston et al., 2018) supports the use of IA immediately following an epidural and after boluses, provided maternal vital signs are normal and the protocol includes assessments every 5 minutes for the first 30 minutes. While more research is needed to guide clinicians in choosing the appropriate monitoring method before, during placement of, and for the duration of regional analgesia, these guidelines may provide support for hospitals in the United States that wish to develop policies that allow for use of IA in this context.

Interpretation and Documentation of Auscultated Findings

Systematic Assessment and Interpretation of IA Findings

The accurate interpretation of uterine activity and FHR characteristics is necessary to guide appropriate interventions during labor. A detailed and systematic approach to evaluating FHM elements may support the development of interpretation skills and ensure that all relevant clinical elements have been assessed and analyzed. A systematic FHM assessment using IA includes determination of baseline FHR characteristics, the presence or absence of accelerations or decelerations, and an assessment of uterine activity (see Table 5). Simpson (2015a) suggests a series of questions to aid in the systematic interpretation of FHM findings. These have been adapted for use with IA and are found in Box 1.

Documentation of FHM Information

Documentation in the medical record reflects the clinician's systematic assessment of FHM and maternal-fetal assessments and captures information about care provided to the woman and her medical history and condition, as well as the trajectory of medical care. It provides data about the patient's care to other clinicians, payers, regulatory agencies, accrediting bodies, researchers, and, in certain cases, to the legal system (American Nurses Association [ANA], 2010).

Each institution should develop interprofessional policies, procedures, and protocols that clearly outline expectations and responsibility for FHM assessment and documentation. These

BOX 1 QUESTIONS SUPPORTING THE SYSTEMATIC INTERPRETATION OF FHM FINDINGS VIA IA

- What is the baseline rate?
- Is it within normal limits for this fetus?
- If not, what clinical factors could be contributing to the baseline rate?
- Are there periodic or episodic FHR changes?
- Are decelerations present?
- Are accelerations present?
- Are findings suggestive of late or variable decelerations?
- What are uterine activity characteristics including frequency, duration, intensity and resting tone?
- What is the relationship between FHR and uterine activity?
- What is the relationship between FHR and maternal vital signs?
- If the FHR is not Category I, what types of interventions would be appropriate to maximize fetal oxygenation?
- Do these interventions resolve the situation?
- Is EFM needed to evaluate the FHR pattern and response to interventions?
- What further interventions are needed?
- Should the physician or midwife be notified? Is a bedside evaluation needed?
- Does the FHR pattern warrant that actions be initiated for expeditious birth?
- What steps should be taken if there is a clinical disagreement among clinicians regarding FHR interpretation or response?

Note. From "Physiologic Interventions for Fetal Heart Rate Patterns," by K. R. Simpson, in *Fetal Heart Monitoring Principles and Practices* (5th ed., p. 166), edited by A. Lyndon and L. U. Ali, 2015, Washington, DC: Association of Women's Health, Obstetric and Neonatal Nurses. Copyright 2015 by the Association of Women's Health, Obstetric and Neonatal Nurses.

should define procedures, documentation principles, and requirements associated with IA and delineate when IA may be used according to gestational age, maternal-fetal diagnoses and risk factors, and stage of labor. Policies should contain information aligned with professional organizations' standards about expected documentation elements and frequency according to stage of labor and risk factors (AAP & ACOG, 2017; AWHONN, 2018b). In most cases, the professional organization recommendations for documentation are offered as a range to account for variation in patient acuity and other factors and to allow for clinical judgment. It is important that policy developers craft organizational policies to maximize and support nurses' autonomy and clinical judgment and limit unnecessary documentation burdens in order to support nurses' ability to provide continuous labor support (Miller, 2011; Smith et al., 2016).

Documentation should be contemporaneous, accurate, objective, and efficient and should include the following: an admission assessment of the woman and her fetus(es), ongoing maternal and fetal assessments, assessment of FHR and uterine activity at specified intervals, any interventions implemented and the maternal and fetal

responses, communication with the woman and her support persons, communication with other clinicians, and any communication within the chain of communication (AWHONN, 2018b). Documentation of the FHR category is considered optional and should be addressed in institutional policy (AWHONN, 2018b; Lyndon, & Zlatnik, 2015; Wisner & Ali, 2015).

Frequency of Assessment and Documentation

Various professional guidelines offer recommendations regarding the frequency of uterine and FHR assessment and documentation when using IA (ACNM, 2015; AAP & ACOG, 2017; AWHONN 2018b). Familiarity with these guidelines is recommended when developing unit policies and procedures for FHM protocols for IA and EFM. Recommendations by AWHONN for assessment and documentation of fetal status during labor for women with low-risk pregnancies not receiving oxytocin are summarized in Table 4. In addition to specified intervals, documentation should reflect the fetal response to rupture of membranes, vaginal examinations, maternal position changes, or fetal scalp stimulation (ACNM, 2015). The expectation is that IA findings are documented at the time of assessment since there is no archived fetal monitoring tracing (AWHONN, 2018b).

Uterine Activity

The evaluation of uterine activity using IA includes the clinician's subjective palpated assessment of contraction frequency, duration, and intensity and resting tone between contractions. Contraction frequency is measured as the interval from the start of one contraction to the beginning of the next, measured in minutes. Contraction duration is measured in seconds and is timed from the beginning of a contraction to its end. If the assessment period spans three or more contractions, these values may be documented as a range (e.g., every 2–3 minutes, lasting 50–60 seconds). The intensity of contractions is assessed via palpation during a contraction and described as mild, moderate, or strong according to the ability to indent the uterus (see Table 2). Uterine resting tone is assessed between contractions and expressed as soft or firm (Wisner & Ali, 2015).

FHR Characteristics

The baseline FHR and rhythm can be evaluated using IA. Variability cannot be assessed, since it requires visual interpretation. The baseline FHR is assessed between contractions during the resting phase of the uterus and documented as a single number instead of rounding to the nearest 5-bpm increment. A normal baseline FHR is between 110–160 bpm. Fewer than 110 bpm would be described as a fetal bradycardia; greater than 160 bpm, a fetal tachycardia. The FHR should be auscultated more frequently if outside the normal range in order to distinguish a bradycardic or tachycardic baseline from periodic or episodic FHR characteristics (see Figure 3). The FHR rhythm is documented as regular or irregular. The maternal pulse should be assessed when using a Doppler or other ultrasound device to perform IA to distinguish it from FHR since blood flow

through the umbilical cord or placenta may be detected with auscultation devices (Wisner & Ali, 2015).

Accelerations and Decelerations

Auscultation can identify accelerations and decelerations of the FHR from baseline, and these may be described as gradual or abrupt. Other documentation of FHR decelerations should include the nadir rate and whether they are recurrent or non-recurrent (ACNM, 2015). The presence of accelerations (whether spontaneous or stimulated) indicates adequate fetal oxygenation and reliably rules out acidemia at the time that accelerations are observed (Macones et al. 2008; Parer, 1997). However, the absence of accelerations does not predict fetal acidemia (Macones et al. 2008).

Classification of Fetal Heart Rate Characteristics

The three-tiered nomenclature from the National Institute of Child Health and Human Development has been adapted for IA (Lyndon, O'Brien-Abel, & Simpson, 2015). Category I auscultated FHR characteristics are considered normal and include a normal FHR baseline (110–160 bpm), a regular rhythm, the presence or absence of FHR accelerations from baseline, and the absence of decelerations from baseline (Lyndon, O'Brien-Abel, et al., 2015). Category II, or indeterminate, auscultated FHR findings include all findings not classified as normal or Category I. An irregular rhythm, tachycardia or bradycardia, and the presence of decelerations are all considered indeterminate findings (see Box 2). Category III or abnormal FHR findings include an assessment of variability that requires visual evaluation and thus cannot be assessed using IA (Lyndon, O'Brien-Abel, et al., 2015).

When Category II FHR characteristics are detected using IA, these should be interpreted in light of the overall clinical picture and the evolution of FHR assessments over time. The frequency and duration of auscultation should be increased, or electronic fetal monitoring initiated, in order to appropriately clarify FHR and uterine characteristics and guide interventions (see Figure 3).

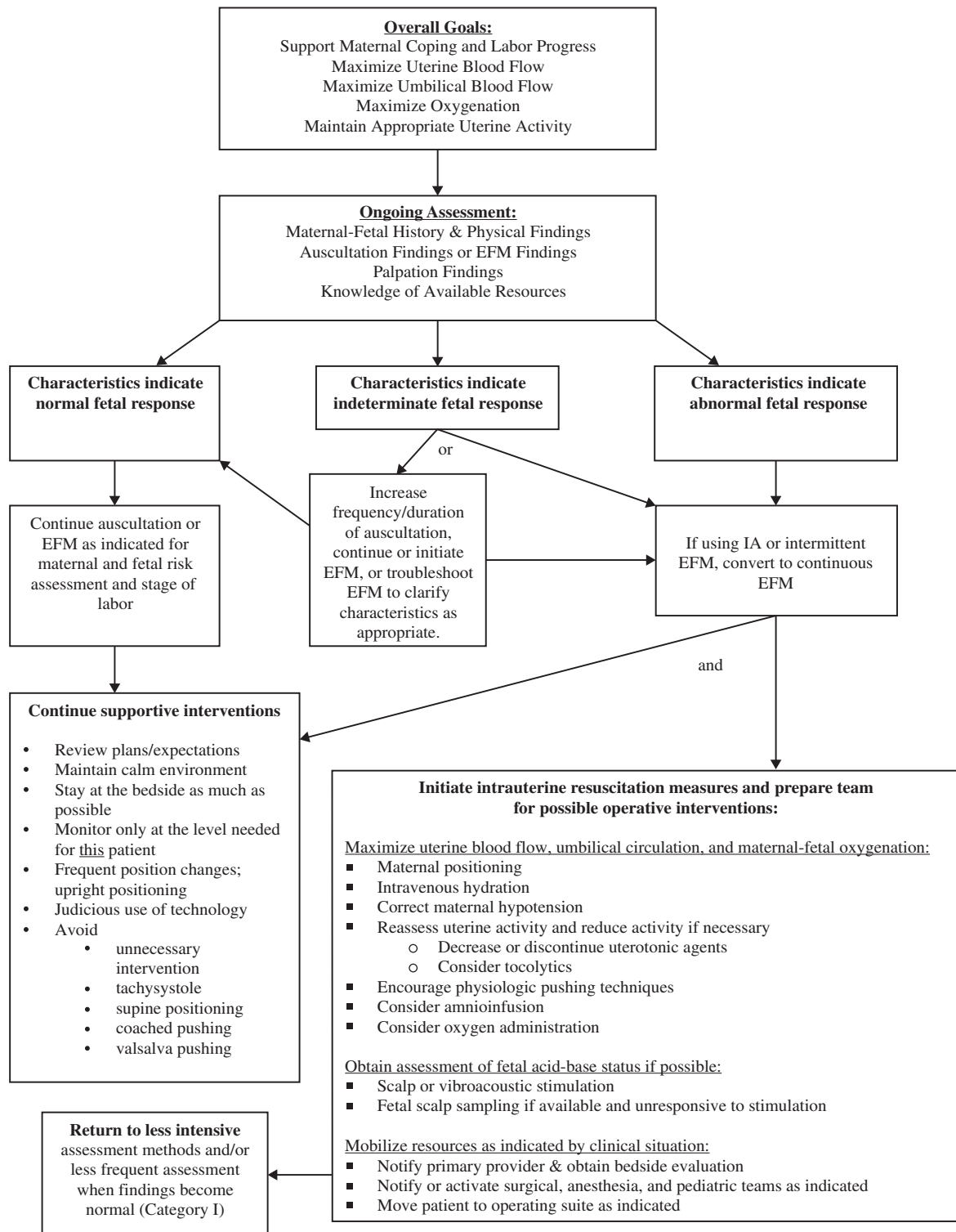
Clinical Decision-Making and Interventions

Introduction

The assessment, interpretation, and evaluation of FHM information requires multidimensional clinical skills that develop over time. Clinicians should include women and their families in collaborative decision-making aimed at achieving a patient-centered plan for care. Such a plan should be informed by the ongoing systematic analysis of maternal-fetal assessments and FHM data. The Collaborative Process and Fetal Heart Monitoring model (see Figure 4) suggest a framework for the ongoing collaborative assessment, interpretation, diagnosis, intervention, evaluation, and management of FHM and other maternal-fetal information.

Clinical interventions implemented in response to FHM information should support maternal coping and labor progress, maximize oxygenation and uterine and umbilical cord blood flow, and

FIGURE 3 FETAL MONITORING DECISION TREE



Note. From "Fetal Heart Rate Interpretation," by A. Lyndon, N. O'Brien-Abel, and K. R. Simpson, in *Fetal Heart Monitoring Principles and Practices* (5th ed., p. 153), edited by A. Lyndon and L. U. Ali, 2015, Washington, DC: Association of Women's Health, Obstetric and Neonatal Nurses. Copyright 2015 by the Association of Women's Health, Obstetric and Neonatal Nurses.

BOX 2 INTERPRETATION OF AUSCULTATION FINDINGS

CATEGORY I

Category I FHR characteristics by auscultation include all of the following:

- Normal FHR baseline between 110 and 160 bpm
- Regular rhythm
- Presence or absence of FHR increases or accelerations from the baseline rate
- Absence of FHR decreases or decelerations from the baseline

CATEGORY II

Category II FHR characteristics by auscultation include any of the following:

- Irregular rhythm
- Presence of FHR decreases or decelerations from the baseline
- Tachycardia (baseline > 160 bpm > 10 minutes in duration)
- Bradycardia (baseline < 110 bpm > 10 minutes in duration)

Note. From "Fetal Heart Rate Interpretation," by A. Lyndon, N. O'Brien-Abel, and K. R. Simpson, in *Fetal Heart Monitoring Principles and Practices* (5th ed., p. 91), edited by A. Lyndon and L. U. Ali, 2015, Washington, DC: Association of Women's Health, Obstetric and Neonatal Nurses. Copyright 2015 by the Association of Women's Health, Obstetric and Neonatal Nurses.

support appropriate uterine activity. Give consideration to the woman and her family's goals and preferences for the monitoring method in labor while supplying understandable information about associated risks. Select interventions in response to auscultated FHM data based on a clinical understanding of the physiologic processes as well as with the maternal-fetal risk factors and physical examination (see Figure 3).

Labor Support

The provision of effective and patient-centered labor support begins with an assessment of the woman and her family's values, desires for the birth experience, and cultural and personal preferences (AWHONN, 2018a). Support in labor includes tailoring interventions to align with these goals and wishes while providing information about risks and benefits using accessible and understandable language. Clinicians should be attentive to their body language, communication and listening skills, and care practices, since these are known to affect the birth experience (Lawrence et al., 2012). Labor support also includes maintaining a calm environment, implementing measures to enhance emotional and physical comfort and well-being, reducing pain, and advocating on behalf of the woman and her support persons. The quality of women's communication with clinicians and an emphasis on shared decision-making improve their perceptions of the birth experience and should be a focus for perinatal clinicians (Attanasio, McPherson, & Kozhimannil, 2014).

When compared to usual care, continuous one-to-one labor support has been shown to have multiple benefits. These include the following: increased likelihood of having a spontaneous vaginal birth; shortened labor duration; improved patient satisfaction; decreased

chance of cesarean birth and instrumental operative vaginal birth; and reduced use of pain medication and regional analgesia, incidence of a low 5-minute Apgar score, and negative feelings about childbirth experiences (Bohren, Hofmeyr, Sakala, Fukuzawa, & Cuthbert, 2017). Labor support by an experienced provider who is present solely for that purpose and is not part of the woman's network was shown to be beneficial. In situations where other support is unavailable, support from a designated family member or friend appears to improve a woman's satisfaction and overall birth experience (Bohren et al., 2017).

Interventions for Category II FHR Findings Using IA

Interventions to promote maternal and fetal adaptation to labor may be needed to ameliorate or improve FHM characteristics associated with Category II findings. Such interventions should be based on specific elements of FHR characteristics and their underlying physiologic cause, if known (see Table 6). Ongoing heightened surveillance is necessary when Category II (indeterminate) FHR characteristics are detected using IA. In addition, consideration should be given to the evolution of FHR characteristics over time in the context of maternal-fetal risk factors and clinical concerns (Vintzileos & Smulian, 2016).

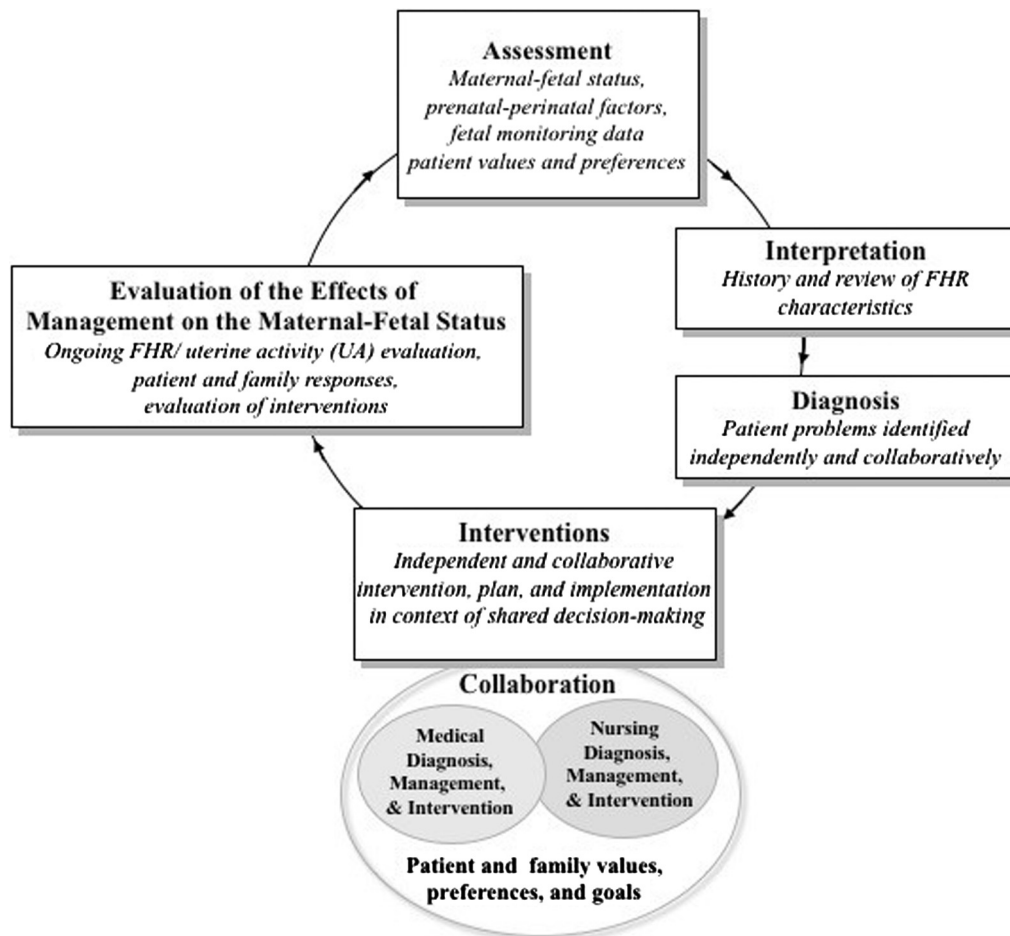
Since Category II auscultated findings include all findings not classified as Category I (normal), EFM may be needed for a period of time to delineate a Category II from a Category III FHR pattern and/or clarify the characteristics of a Category II pattern (ACNM, 2015). This is important for guiding initial and ongoing interventions and the choice of monitoring method. Once the FHR pattern indicates a normal fetal response, IA may be resumed.

Changes in FHR Baseline

Fetal tachycardia. While fetal tachycardia alone is not strongly correlated with fetal hypoxemia or acidemia, fetal acidemia cannot be ruled out when tachycardia is accompanied by minimal or absent variability, recurrent decelerations, or no accelerations (ACOG, 2010). Fetal tachycardia should be investigated further with EFM in order to assess variability and the characteristics and frequency of any decelerations. A rarer finding is a fetal tachyarrhythmia, where the FHR is usually greater than 200 bpm (ACOG, 2010). These arrhythmias are caused by abnormalities of intrinsic control of the fetal cardiac rhythm and require continuous EFM with possible medical treatment since fetal status may deteriorate over time (Cuneo, 2008).

Fetal bradycardia. A previously identified or known fetal bradycardia may be due to normal physiologic variation and is usually benign (Jaeggi & Friedberg, 2008). However, persistent FHRs below the third percentile may indicate significant conduction disease (Wacker-Gussmann, Strasburger, Cuneo, & Wakai, 2014). Any new onset bradycardia identified using IA should be promptly evaluated to determine the underlying cause and to identify the nature of the decrease in FHR (Jaeggi & Friedberg, 2008). Prolonged decelerations or bradycardias may occur suddenly following a normal FHR baseline

FIGURE 4 COLLABORATIVE PROCESS AND FETAL HEART MONITORING



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and may result from a variety of causes (ACOG, 2010). Bradycardia in the range of 80–110 bpm with moderate variability may be considered normal for certain fetuses; however, such a diagnosis requires the use of EFM since variability cannot be assessed with IA. The provider should be consulted to determine the best monitoring method for the intrapartum period if these lower rates are present.

Irregular Heart Rate Rhythm

The incidence of fetal cardiac arrhythmias is estimated at 1%–3% of pregnancies. Less than 10% are related to a persistent and clinically significant brady- or tachyarrhythmia, with the remaining 90% associated with an irregular rhythm caused by ectopic beats (Strasburger, Cheulkar, & Wichman, 2007). Fetal ectopy is most often atrial and is usually considered benign with spontaneous resolution after birth in most cases. However, any fetal ectopy warrants further evaluation since it has been associated with conduction defects, a rarer, more serious finding (Maeno, Hirose, Kanbe, & Hori, 2009).

Even when benign, the presence of an irregular rhythm when using IA constitutes a Category II FHR status; hence, decisions

surrounding the use of IA as a primary monitoring method throughout labor should be made in consultation with the provider and the woman and her family. While most fetal arrhythmias are detected during the antepartum period, any new onset irregular rhythm should be evaluated further in consultation with the provider as additional testing and treatment may be necessary.

Decelerations

FHR decelerations may be caused by fetal head compression; placental insufficiency; underlying maternal disease; intermittent or prolonged umbilical cord occlusion; or sudden or sustained interruptions in maternal, uterine, or fetal oxygenation (ACOG, 2010; Freeman, Garite, Nageotte, & Miller, 2012). Early decelerations are considered clinically benign and do not require intervention. Late and variable decelerations occur along a continuum and must be evaluated in the context of the overall clinical picture, their frequency, associated FHR characteristics (such as variability and baseline), and the evolution of FHR assessments

TABLE 6 CAUSES OF CATEGORY II FHR CHARACTERISTICS

Baseline Changes	
Tachycardia	Bradycardia
Maternal Factors: • Dehydration • Infection (chorioamnionitis, pyelonephritis) • Beta-sympathomimetic drugs (terbutaline, epinephrine) • Parasympathetic drugs (scopolamine, atropine, phenothiazines, hydroxyzine) • Illicit drugs (cocaine, methamphetamine, other stimulants) • Medical or obstetric conditions (hyperthyroidism, abruption, hemorrhage) Fetal Factors: • Anemia • Hyperthyroidism • Heart failure • Hypoxemia • Increased metabolic rate • Infection or sepsis • Tachyarrhythmia	Maternal Factors: • Respiratory depression • Apnea • Seizure • Anaphylactoid syndrome of pregnancy • Uterine rupture • Placental abruption • Maternal hypotension • Medications • Hypoglycemia • Hypothermia • Excessive uterine activity Fetal Factors: • Heart block • Prolapsed umbilical cord • Umbilical cord occlusion • Fetal bradyarrhythmia • Vagal stimulation
Decelerations	
Variable Decelerations: • Umbilical cord compression/occlusion ◦ Causes may include: ■ Oligohydramnios ■ Cord prolapse ■ Cord knot or short, bandolier, or nuchal cord Late Decelerations: • Transient or chronic placental insufficiency • Maternal hypotension • Excessive uterine activity • Placental abruption • Intrauterine growth restriction • Maternal conditions (hypertensive disorders, diabetes mellitus, asthma, pneumonia) Prolonged Decelerations: • Uterine tachysystole • Acute maternal hypotension • Acute maternal hypoxia (seizure, or respiratory or cardiac arrest) • Placental abruption • Uterine rupture • Cord compression or prolapse • Ruptured vasa previa • Profound fetal head compression • Rapid fetal descent	

Note. Sources: ACOG (2010); Freeman, Garite, Nageotte, & Miller (2012); Lyndon, O'Brien-Abel, & Simpson (2015).

over time. Prolonged decelerations are indistinguishable from fetal bradycardia initially and usually require clinical intervention before they have been identified as such (ACOG, 2010). They may be associated with an obstetric emergency and require immediate intervention.

Decelerations detected when using IA require prompt reevaluation. Since IA cannot identify deceleration types, evaluation with EFM is warranted to further investigate associated characteristics in order to appropriately guide intrauterine resuscitation techniques aimed at the suspected

TABLE 7 INTRAUTERINE RESUSCITATION

Goal	Techniques/Methods
Promote fetal oxygenation	• Lateral positioning (either left or right) • IV fluid bolus of at least 500 ml of lactated Ringer's solution • Pushing with every other or every third contraction or discontinuation of pushing temporarily (during second stage labor) • Oxygen administration at 10 L/min via non-rebreather face mask (discontinue as soon as possible based on the fetal response)
Reduce uterine activity	• IV fluid bolus of at least 500 ml of lactated Ringer's solution • Lateral positioning (either left or right)
Alleviate umbilical cord compression	• Repositioning • Pushing with every other or every third contraction or discontinuation of pushing temporarily (during second stage labor) • If prolapse umbilical cord is noted, elevation of the presenting fetal part as preparations are under way for expeditious birth may be effective
Correct maternal hypotension	• Lateral positioning (either left or right) • IV fluid bolus of at least 500 ml of lactated Ringer's solution

Note. From "Fetal assessment during labor," by A. Lyndon, N. O'Brien-Abel, and K. R. Simpson, in *AWHONN's Perinatal Nursing* (4th ed., p. 461), edited by K. R. Simpson and P. A. Creehan, 2013, Washington, DC: Association of Women's Health, Obstetric and Neonatal Nurses. Copyright 2013 by the Association of Women's Health, Obstetric and Neonatal Nurses. Adapted with permission. IV = intravenous.

underlying cause and/or the need for expeditious birth. Additional assessments and interventions may include a vaginal examination to rule out umbilical cord prolapse or rapid fetal descent, mobilization of the perinatal team to support resuscitation efforts and/or plan for expeditious birth, and assessment of maternal pulse to distinguish the FHR baseline change from maternal heart rate.

Intrauterine Resuscitation

The goals of intrauterine resuscitation are to support maternal coping and labor progress, maximize uterine blood flow and umbilical circulation, maximize oxygenation, and maintain appropriate uterine activity. Intrauterine resuscitation refers to a series of interventions (Simpson, 2015a). When using IA for fetal surveillance, these interventions may include the following:

- Maternal repositioning
- Reduction of uterine activity
- Intravenous fluid bolus
- Correction of maternal hypotension
- Oxygen administration
- Physiologic pushing techniques or modification of pushing efforts

These interventions are thought to improve maternal blood flow, placental perfusion, and fetal oxygenation. While research has demonstrated positive effects on fetal oxygenation from certain uterine resuscitation techniques, no data suggest that they are capable of reversing fetal acidemia (Simpson, 2015a). See Table 7 for a summary of intrauterine resuscitation techniques and related goals.

Maternal Positioning

Lateral positioning alleviates compression of the maternal vena cava and aorta and thus maximizes maternal cardiac output and return and improves uterine perfusion (Freeman et al., 2012). Lateral positioning (or repositioning) can also relieve umbilical cord compression by changing the relationship between the uterine wall, umbilical cord, and fetal parts (Simpson, 2015a). Researchers have compared fetal oxygenation status in right lateral, left lateral, and supine maternal positions. They found improved fetal oxygenation in the left lateral position (Aldrich et al., 1995; Carbone, Benachi, Lèvèque, Cabrol, & Papiernik, 1996) and in left and right lateral positions (Simpson & James, 2005) when compared to supine. The lateral position has been associated with fewer late decelerations and more FHR accelerations when compared to supine (Abitbol, 1985; Abitbol, Monheit, Poje, & Baker, 1986).

Reduction of Uterine Activity

Uterine contractions of sufficient intensity cause a collapse of the spiral arteries when intramyometrial pressure exceeds that of the spiral arteries. This causes an intermittent interruption of blood flow and oxygenation to the fetus (Freeman et al., 2012). Most fetuses tolerate the interruption in oxygenation associated with normal uterine contraction activity, provided uteroplacental perfusion and oxygen exchange are normal. However, excessive uterine activity (tachysystole) places the fetus at risk for hypoxemia (ACOG & AAP, 2014). Other contraction characteristics such as intensity, duration, and resting tone are clinically important and should be included in the evaluation of uterine activity (Macones et al., 2008).

Tachysystole has been associated with adverse maternal and neonatal outcomes, including increased cesarean birth, operative

vaginal birth, NICU admission, and sepsis (Heuser et al., 2013). Studies have suggested that even more conservative definitions of excessive uterine activity (five or more contractions in 10 minutes, averaged over 30 minutes) have been associated with adverse neonatal outcomes that include decreased fetal oxygen saturation, increased incidence of absent and minimal variability and of late and recurrent decelerations (Simpson & James, 2008), and fetal acidemia (umbilical artery pH 7.11 or less at birth; Bakker, Kurver, Kuik, & Van Geijn, 2007).

Research suggests that even brief periods of excessive uterine activity affect fetal oxygenation (Simpson & James, 2008); hence, interventions for tachysystole should not be delayed until the FHR exhibits indeterminate characteristics. (Simpson, 2013, 2015a). Intrauterine resuscitation techniques used to reduce uterine activity in the context of IA include lateral positioning and the administration of an IV fluid bolus. Prompt evaluation of the FHR to delineate associated Category I or II characteristics is warranted when tachysystole is detected using IA. Fetal acidemia should be ruled out by confirming moderate variability or the presence of accelerations with EFM when Category II FHR characteristics are auscultated in the presence of tachysystole (ACOG, 2010).

Administration of Intravenous Fluids

The administration of IV fluids in labor is thought to improve placental perfusion by maintaining or correcting maternal intravascular volume. Data on the efficacy of the administration of an IV fluid bolus as an intrauterine resuscitation technique are limited. The administration of a 500–1000 ml bolus of Ringer's lactate solution was found to significantly increase fetal oxygenation, with the largest increases observed in women receiving the 1000-ml bolus (Simpson & James, 2005). When recurrent late decelerations, prolonged decelerations, fetal bradycardia, or minimal or absent FHR variability is observed, ACOG (2010) recommends initiation of an IV fluid bolus as an intrauterine resuscitation measure to promote uteroplacental blood flow and fetal oxygenation.

Close monitoring of total fluid intake and output is important when administering IV fluids, especially in the context of certain medical conditions or use of medications known to affect maternal fluid balance or hemodynamic stability. These include cardiac disease, preeclampsia, and the use of magnesium sulfate and other tocolytics (Lamont, 2000; Sciscione et al., 2003; Xiao, Gangal, & Abenhaim, 2014). Pregnancy is a risk factor for pulmonary edema because of a decrease in maternal colloid osmotic pressure and increases in cardiac output and plasma volume. The use of an isotonic solution is recommended instead of glucose-containing solutions since intravenous glucose may have adverse neonatal and maternal effects (Simpson, 2015a).

Maternal Oxygen Administration

Studies have demonstrated an increase in fetal oxygenation from lateral positioning, IV fluid bolus, and oxygen administered via a non-rebreather face mask at 10 liters per minute (Haydon et al., 2006; Simpson & James, 2005). The greatest increases in fetal oxygenation occurred in fetuses with lower baseline fetal oxygen saturations

(Simpson & James, 2005). Since there are no data examining the ideal duration of oxygen administration, its use should be limited to the shortest amount of time necessary to achieve the desired effect (Simpson, 2008).

The routine use of maternal oxygen to treat indeterminate or abnormal FHR characteristics has been questioned in women without evidence of maternal hypoxia (Hamel, Anderson, & Rouse, 2014). However, most experts and guidelines support the judicious and stepwise application of oxygen to women in labor with a Category III FHR tracing or certain Category II FHR characteristics (ACOG, 2010; Garite, Nageotte, & Parer, 2015). Category II characteristics likely to benefit from oxygen administration include recurrent late or prolonged decelerations, significant variable decelerations, bradycardia, or persistent minimal or absent variability (Garite et al., 2015). Because of concerns over the potential adverse effects of oxygen administration, which may include free radical damage to maternal and fetal tissues, oxygen administration should be used judiciously after other intrauterine resuscitation measures have been implemented, such as lateral positioning, discontinuation or reduction in the oxytocin infusion, and IV hydration (Simpson, 2008).

Alteration to Maternal Pushing Efforts in Second Stage

A thorough review of interventions to promote maternal and fetal well-being and avoid iatrogenic harm during the second stage of labor is presented elsewhere (AWHONN, 2018c; Simpson, 2015a). A summary of second-stage labor care to promote fetal well-being is presented in Box 3. When Category II FHR characteristics are detected, reducing pushing efforts to every other or every third contraction may allow the fetus to recover and prevent further deterioration of fetal status (AWHONN, 2018c; Simpson, 2015a).

While use of EFM is often a reflexive choice for clinicians when presented with Category II FHR findings, data fail to support that its use leads to improved birth outcomes (see literature review section). Continuous, stepwise, judicious use of IA may be appropriate with certain Category II findings, especially when this is the woman's preferred monitoring method.

Communication of IA Findings

Communication regarding FHM during the intrapartum period includes the exchange of verbal, nonverbal, and written information among clinicians, the laboring woman, and her support persons. Effective patient-centered communication has become a central focus in health care as there is a growing appreciation for how effective the quality and efficacy of communication is on a multitude of provider-, institutional-, and patient-level outcomes. These range from patient and provider satisfaction and perceptions of safety to severe maternal and neonatal morbidity and mortality (Attanasio et al., 2014; Grunebaum, Chervenak, & Skupski, 2011; The Joint Commission [TJC], 2016; Wagner et al., 2012). Root cause analyses of a variety of reported sentinel events during the last 10 years have consistently identified communication issues as a leading contributor to adverse outcomes (TJC, 2016).

BOX 3 SECOND-STAGE LABOR CARE TO PROMOTE FETAL OXYGENATION

- For women with epidural anesthesia who do not feel the urge to push when they are completely dilated, consider delaying pushing until the urge to push is felt (up to 2 hours for nulliparous women and up to 1 hour for multiparous women).
- Discourage prolonged breath holding. Instead, instruct the woman to bear down and allow her to choose whether or not to hold her breath while pushing.
- Discourage more than three pushing efforts with each contraction and more than 6–8 seconds of each pushing effort.
- Avoid counting to ten to promote sustained breath holding during pushing efforts.
- Take steps to maintain a normal FHR pattern while pushing. Maternal pushing efforts may need to be modified based on the FHR pattern. Push with every other or every third contraction if necessary to avoid recurrent FHR decelerations. Reposition as necessary for FHR decelerations.
- Avoid tachysystole during the second stage of labor.

Note. From *Nursing Care and Management of the Second Stage of Labor* (3rd ed.), by the Association of Women's Health, Obstetric and Neonatal Nurses, 2018, Washington, DC: Author. Copyright 2018 by the Association of Women's Health, Obstetric, and Neonatal Nurses. Reprinted with permission. FHR = Fetal heart rate.

Communication With the Woman and Her Family

While there is a continued emphasis on patient-centered care as a key objective in achieving optimal quality in perinatal care (Lawrence et al., 2012), patients and providers report barriers to its implementation (Jacobson, Zlatnik, Kennedy, & Lyndon, 2013; Moore, Low, Titler, Dalton, & Sampsel, 2014). Women should be encouraged to participate in the ongoing decision-making process regarding monitoring method during labor. This can be facilitated by engaging women in a collaborative process of exploring choices, clarifying options, and assisting in the shared decision-making process (Klassa, Dendrinis, Penn, & Radke, 2016). Choices and options should be presented using understandable terminology and include information about the associated risks and benefits, indications, and limitations of each method (ACNM, 2015). Discussions about the woman's preferences regarding FHM and disclosure about typical institution- or provider-specific interventions such as intravenous fluids, diet restrictions, and allowing mobility in labor should ideally begin during the prenatal period. This allows for the exploration of questions and concerns prior to admission to the perinatal unit, thus supporting women and their families to be full partners in the decision-making process (ACOG, 2017a).

Effective and sensitive communication with the woman and her family involves exploring their desires and preferences for the birth experience, including any cultural, religious, or personal values that may influence care. Qualified translators should be used when the woman's primary language is not English (TJC, 2014). When inquiring about sensitive or private information, providers should ask the woman who she would like to have present during the discussion and ensure privacy to avoid confidentiality breaches.

When preparing to auscultate the FHR, the care provider should explain to the woman and her support persons how the equipment works, what sounds are heard, and what the findings mean in lay terms. In addition, the care provider should discuss what might happen if the indeterminate FHR characteristics are detected so the woman and her support persons are prepared if intrauterine resuscitation techniques are initiated quickly.

Effective Clinician Communication

All major obstetric professional organizations in the United States emphasize the importance of using standardized nomenclature for the communication of FHM information as a way to ensure effective communication of clinical information and to decrease error (ACNM, 2010; ACOG, 2009; AWHONN, 2018b). The standardized nomenclature defined in the National Institute of Child Health and Human Development workshop report (Macones et al., 2008) are recommended for use in practice by AWHONN (2018b), ACNM (2010), and ACOG (AAP & ACOG, 2017; ACOG, 2009) and should be used when communicating FHM information. This should include use of the two-tiered nomenclature when using IA (Lyndon, O'Brien-Abel, & Simpson, 2015; see Box 2).

Communication between providers should be clear, direct, and patient-centered. Elements of FHM information that form a complete picture of maternal-fetal status include: labor progress and stage of labor, maternal coping, relevant medical and obstetric history and results of diagnostic tests or labs; vital signs, FHR and uterine activity; the evolution of FHR changes over time, changes in maternal-fetal status, and interventions implemented and subsequent maternal-fetal response.

Individual clinicians can proactively contribute toward effective communication and collaboration by assuming positive intentions in others, understanding their perceptions and the perceptions of others are informed by personal perspectives and worldviews, and keeping the patient's safety and best interests at the center of all activity and interactions (Lyndon, Johnson et al., 2015). When requesting a provider evaluation, concise and effective communication should include a clear statement of the problem, relevant history and background, the clinician's analysis of the situation including a consideration of available options, and a clearly stated recommendation and request (Institute for Healthcare Improvement, 2018).

Communication Tools and Techniques

Various strategies and tools have been developed to aid clinicians in communicating information. These include tools to communicate critical information during periods of heightened

TABLE 8 SBAR-R-R COMMUNICATION TECHNIQUE APPLIED TO FETAL HEART MONITORING

Prepare for an SBAR-R-R by:

1. Assessing the patient
2. Reviewing recent notes and laboratory results
3. Having the medical record available during the conversation

Situation: Always identify yourself, where you are calling from, the name of the woman you are calling about, quickly state the main reason and the level of urgency for the call.

Background: Give brief pertinent background information – medical history, complaints, vital signs, and interventions that have already occurred

Assessment: Say what you think is going on

Recommendation: Say what you think should happen or ask for specific orders

Reasoning: If the response is not what you expect and requested, state why what you think should happen is important. What could happen if we don't do this?

Ratification: Close the loop by confirming actions to be taken. Assure mutual agreement on the plan.

Situation

I am calling about Ms. ____, who was admitted this morning for labor, and initially monitored using IA. A deceleration was heard and EFM was applied to clarify. I am concerned about the FHR pattern:

- Baseline FHR is ____.
- Variability is ____ (absent, minimal, moderate, marked)
- There are recurrent ____ (variable, late, prolonged) decelerations
- She needs a bedside evaluation

Background—include the following

- GPTAL @ __ weeks
- Significant OB and medical history
- Cervical dilatation
- Labor progress
- Vital signs
- Recent changes in FHR tracing baseline, variability, accelerations, decelerations
- Uterine activity
- Interventions already completed

Assessment

- The FHR tracing is indeterminate and the decelerations do not resolve with position change.
- I'm concerned the fetus is at risk for acidemia.

Recommendation

- I need you to come and evaluate her now.
- When can I expect you?

Reasoning

- The variability was moderate when the EFM was applied but in the last 45 minutes became minimal and the variable decelerations are deeper and lasting longer. The fetus may be running out of reserve. It is important that she be evaluated now.
- If you are not able to come now, who should I call to evaluate the patient?

Ratification

- Ok, I'll do ____, and you'll be here to evaluate her in ____.

Note. Adapted from [Institute for Healthcare Improvement \(2018\)](#).

concern and those designed to ensure that important clinical information is communicated from one care provider to another during routine handoffs or transfers from one level of care to another. In addition, tools and techniques are available to improve team communication and response during emergency situations ([Agency for Healthcare Research and Quality, n.d.](#)). Data that compare different techniques and tools are lacking ([Smeulers, Lucas, & Vermeulen, 2014](#)). However, there is evidence that use of communication tools improves communication quality, team functioning, and safety climate ([Beckett & Kipnis, 2009](#); [Merien, van de Ven, Mol, Houterman, & Oei, 2010](#); [Pettker et al., 2011](#); [Phipps et al., 2012](#)).

The use of SBAR (situation, background, assessment, recommendation) and SBAR-R-R (situation, background, assessment, recommendation, reasoning, ratification) is recommended by [AWHONN \(2017a, 2017b, 2017c, 2017d\)](#) for structuring communication between clinicians. This provides a consistent framework for communicating clinical information. See [Table 8](#) for a recommended format for using SBAR-R-R when communicating FHM information.

Conflict Resolution

When there is disagreement among clinicians, a process of collaborative resolution should be sought, including use of the chain of communication, if necessary. If the disagreement does not occur during an emergency, clinicians should attempt to resolve it using active listening skills and a constructive patient-centered approach. Conflicts that arise during urgent or emergency situations or in the presence of the woman and her family can be especially challenging to manage and resolve. Divergent perspectives on what constitutes best practice, different interpretations of the clinical situation and/or threat, and competing priorities may contribute to clinical disagreement and conflict. When seeking resolution, it may be helpful to assume that all perinatal clinicians share the same goal—safe and effective care of the laboring woman and her fetus ([Lyndon et al., 2014](#); [Simpson, James, & Knox, 2006](#)).

Educational Issues

Proficiency in the IA method requires cognitive knowledge, psychomotor skill, critical thinking, effective communication, and competent decision-making. The use of IA has become a somewhat lost art because most clinicians have been educated about FHM in clinical environments where EFM is the predominant method of fetal surveillance. Even when intermittent monitoring is used, it is often accomplished using the ultrasound of the fetal monitoring machine instead of handheld equipment such as a Doppler device. To ensure competence in IA, [AWHONN \(2018b\)](#) recommends that each institution offer educational programs that include clinical experience, skills validation, and ongoing competence assessment. Content should include the physiologic basis for FHM, interpretation, labor support, and communication strategies and should ideally be taught and practiced interprofessionally ([AWHONN, 2018b](#)).

BOX 4 SUGGESTED CURRICULUM FOR ACQUIRING AUSCULTATION SKILLS

- Physiologic basis of FHM
- Evidence about FHM methods
- Review of institutional policies surrounding FHM
- Labor support techniques
- Review and practice of the IA method
- Interpretation and documentation of IA findings
- Clinical decision-making and interventions
- Communication and conflict resolution or chain of communication
- Discussion of strategies for the implementation of IA as the default FHM method for low-risk women

Education alone may not be sufficient to support appropriate use and enculturation of IA into practice. Factors such as organizational or unit culture, the expectations of others, staffing and acuity issues, patient care and documentation demands, and liability concerns may influence nurses' intention and ability to use IA (Hersh et al., 2014; Patey et al., 2017; Payant, Davies, Graham, Peterson, & Clinch, 2008). Multiple strategies should be employed to provide and communicate an organization's structural and cultural support for IA (Smith et al., 2016). These include having institutional policies supporting IA use, checklists or decision support tools to determine eligibility for IA, order sets that include IA as the default FHM method for women with low-risk pregnancies, and robust clinician and patient education programs surrounding IA (Smith et al., 2016).

Curriculum

Specific content to be included in FHM education programs is summarized in Box 4. Modalities for ongoing skill assessment or competency validation may include a variety of approaches such as case reviews, classroom activities, simulation and drills, review of research literature or clinical improvement projects, and hands-on skills review. An interdisciplinary approach to learning ensures all clinicians receive consistent information, promotes a shared perspective and consistent use of standardized FHM nomenclature, and aids in identifying strengths and knowledge gaps among perinatal team members.

Educational Programs and Certification**AWHONN Fetal Heart Monitoring Program**

The AWHONN FHM program includes introductory, intermediate, and advanced content as well as an instructor course (AWHONN, 2017a, 2017b, 2017c, 2017d). Formats include online and in-person classes. The introductory and intermediate courses include content on IA and are targeted to perinatal clinicians of all professional levels.

Certification

The National Certification Corporation (2018) offers certification in EFM for licensed registered nurses, nurse practitioners, nurse

midwives, and physicians or physician assistants in the United States and Canada. While this certification exam emphasizes EFM, some content is included on IA. The Perinatal Quality Foundation (2018) also offers a fetal monitoring credential (FMC), which does not contain content on IA.

Ongoing Proficiency in Fetal Heart Monitoring

A number of online FHM assessment proficiency programs are available that are geared toward interpretation and management of EFM tracings (Advanced Practice Strategies, 2017; AWHONN, 2017a, 2017b, 2017c; GE Healthcare, 2018; University of Rochester Medical Center, 2018). While most of these programs do not emphasize application or interpretation of IA findings, they do cover content on the physiology of FHR characteristics, clinician teamwork and communication, and the management of common obstetric conditions or scenarios. Thus, these programs can support clinicians in maintaining overall proficiency and skill in the interpretation and management of FHR information.

Staffing Issues

Unit policies should address the level of licensed professionals who may perform IA and define nurse-patient ratios for care of women and fetuses when IA is the primary method of fetal surveillance.

Who Should Perform Intermittent Auscultation

Professional organizations have identified that it is the role of professional registered nurses, advanced practice registered nurses, midwives, physicians, and physician assistants to perform initial and ongoing assessments of maternal-fetal status, including auscultation and EFM (AWHONN, 2018b). It is inappropriate to delegate any assessments or interventions that require professional knowledge, judgment, or skill to unlicensed/unregulated assistive personnel caring for women (National Council of State Boards of Nursing, 2016). Staffing plans need to take into account the appropriate staffing mix necessary when implementing any fetal surveillance method, whether IA or EFM, on the basis of national professional organization guidelines and state scope-of-practice regulations.

Nurse-Patient Ratios

In 2010, AWHONN published *Guidelines for Professional Registered Nurse Staffing for Perinatal Units* to address substantial changes in perinatal care during the past two to three decades (AWHONN, 2010). These updated guidelines replaced the guidelines initially published in the first edition of *Guidelines for Perinatal Care* (AAP & ACOG, 1983). The research review for the guidelines primarily focused on the relationship between nursing staffing and patient outcomes in medical, surgical, and intensive care units and included an online survey of more than 900 AWHONN members (Simpson, Lyndon, Wilson, & Ruhl, 2012). Researchers looking at the relationship between patient outcomes

and nursing staffing in the perinatal setting suggest that inadequate staffing can lead to increased risks to patient safety; this is supported by research that demonstrates a relationship between low nurse–patient ratios and increased patient safety in other nursing specialties (AWHONN, 2010; Simpson & Lyndon, 2017; Simpson, Lyndon, & Ruhl, 2016).

The AWHONN *Guidelines for Professional Registered Nurse Staffing for Perinatal Units* recommend that the optimal nurse–patient staffing ratio is 1:1 when IA is the primary mode of fetal surveillance (2010). In addition, these guidelines specify a nurse–patient ratio of no less than 1:1 in all intrapartum situations, regardless of mode of fetal surveillance, except that of women in labor without complications, in which case the suggested ratio is 1:2 (AWHONN, 2010; Scheich & Bingham, 2015). Therefore, it is recommended that a 1:1 nurse–patient ratio be maintained when IA is used. This 1:1 ratio in reality reflects a 1:2 nurse–patient ratio, given that there are two patients: the woman and the fetus.

The 1:1 nurse–patient ratio required for IA may initially appear as a barrier to its use, especially given that the women with very low-risk pregnancies who are candidates for IA are the same group who could usually be safely cared for with a 1:2 ratio (AWHONN, 2010). It may be a challenge to incorporate IA in settings where patients outnumber providers (ACNM, 2015). A follow-up survey of hospitals after the initial implementation of the 2010 *Guidelines for Professional Registered Nurse Staffing in Perinatal Units* found that 40% of hospitals reported consistently meeting the 1:1 recommended ratio when an IA protocol was used; it is interesting to note that, by way of comparison, only 33% of the hospitals reported consistently meeting the 1:1 guideline for women receiving oxytocin in labor (Scheich & Bingham, 2015). However, it may be useful to consider the benefits of IA when integrated into the care plan for women experiencing an uncomplicated labor, including the high touch and supportive nature of the care and the lack of time spent on use of EFM and other equipment (Hunter, 2002; Wisner, 2015). Just as the unique nature of perinatal care requires tailored approaches to staffing that take into consideration fluctuations in volume, staffing mix, patient acuity level, unit layout, and so on (Simpson, 2009, 2012, 2015b; AWHONN, 2010), care that optimizes outcomes and minimizes the need for intervention for women with low-risk pregnancies, such as the consistent labor support that can be provided with 1:1 nursing care, should also be taken into account (Simpson, 2017; Lyndon, Simpson, & Spetz, 2017). Information specific to the benefits of dedicated labor support for women can be helpful to support staffing changes related to IA (Killion, 2015).

Evidence suggests that adequate nurse staffing improves health outcomes for medical-surgical patients in acute care settings (Aiken et al., 2011; Needleman et al., 2011). Inadequate staffing with professional nurses can result in poorer patient outcomes (Bingham & Ruhl, 2015), including in the perinatal setting. In a secondary analysis of the responses from the AWHONN 2010 nurse staffing survey, Simpson and colleagues (2016) found that nurses felt inadequate staffing on perinatal units had the potential to result in job

dissatisfaction, missed care, and failure to rescue. Additional research is needed to assess the role that staffing can play in optimal care for women in labor (Simpson, 2016); further studies should use nursing-sensitive measures to assess the effect of IA on staffing needs and optimal outcomes.

Legal Issues

Perinatal care in the United States carries a relatively high risk of litigation, and this fact should be acknowledged and comprehensively addressed (Miller, 2018; Sakala, Yang, & Corry, 2013). One analysis of closed claims by nursing specialty found that 10.9% of total claims were related to perinatal nursing, the payments for which represented 25% of the total indemnity paid across all nursing specialties (CNA & Nurses Service Organization, 2015). Providers, and by extension the entire obstetric team, may become the target of a lawsuit when the outcome is other than a normal newborn. In fact, 76% of obstetricians in the United States report having faced litigation at some point in their careers—most often related to allegations of causing cerebral palsy (MacLennan, Nelson, Hankins, & Speer, 2005). Birth injury litigation has been thought to significantly influence obstetric practice in the United States; one example is its contribution to inflated rates of cesarean birth (Sartwelle & Johnston, 2015). McRae (1999) identified lack of obstetric knowledge, lack of EFM interpretation and skill, and failure to follow the standard of care or to communicate and document clinical findings as some of the reasons that perinatal nurses are implicated in the cases of a poor fetal outcome. In addition, the experience of being involved in a malpractice suit can cause significant trauma to nurses and other health care providers (Chan, Khong, & Wang, 2017).

As discussed previously, recent practice recommendations align with women's reported preferences to support increased availability of IA for fetal surveillance (ACNM, 2015; Cox & King, 2015; Smith et al., 2016). According to Miller (2015), there are three focus areas of risk management in use of IA: "(1) informed consent of the laboring woman regarding mode of monitoring; (2) staff education and training in IA; and (3) documentation issues, including policies and procedures" (p. 197). While it is the responsibility of the physician or midwife to obtain informed consent, it is the nurse's duty to act as a patient advocate in the decision-making process. This would include ensuring that the woman understands IA and EFM procedures; is aware of the indications (and lack of indications) for each method; has been informed of the risks, benefits, and alternatives; and understands the current recommendations and the quality of the evidence on which they are based (Miller, 2015). In a review article about litigation related to IA, Borg (2003) reassured nurses by indicating that proper documentation of IA is an invaluable part of the defense. For more information on appropriate education and documentation regarding IA that could help to minimize litigation risk, please see those sections of this monograph.

There is much less evidence for medical malpractice issues related to IA when compared to EFM, likely because of the greater

BOX 5 COMPONENTS OF SUCCESSFUL IMPLEMENTATION OF INTERMITTENT FETAL MONITORING

- Policies should include a risk assessment tool or checklist with exclusion criteria to assist in identifying women for which intermittent auscultation or intermittent EFM is appropriate (Spong, Berghella, Wenstrom, Mercer, & Saade, 2012).
- Provide patient education for the use of intermittent methods of monitoring, including the risks and benefits of intermittent versus continuous methods, and engage in shared decision making in order to determine most appropriate method for each woman.
- Provide ongoing assessment of women to determine appropriateness of continued intermittent methods versus conversion to continuous EFM (Spong et al., 2012).
- Engage in initial and ongoing training and education of all nurses and providers on intermittent auscultation or intermittent EFM procedures.
- Provide appropriate staffing, e.g., 1:1 nursing care as recommended by AWHONN for intermittent auscultation in low-risk women (AWHONN, 2010).
- Work with necessary committees and Information Technology (IT) to modify admission orders to reflect the use of intermittent EFM or auscultation as the default mode of monitoring for women who do not meet the exclusion criteria.
- Ensure that the appropriate equipment, such as Dopplers, are readily available in sufficient numbers.
- Develop a competency tool for evaluating knowledge of procedures and use of equipment.

Note. From *Toolkit to Support Vaginal Birth and Reduce Primary Cesareans: A Quality Improvement Toolkit* (p. 48), by H. Smith, N. Peterson, D. Lagrew, and E. Main, 2016, Stanford, CA: California Maternal Quality Care Collaborative. Copyright 2016 by California Maternal Quality Care Collaborative. Reprinted with permission.

frequency with which EFM is used. However, measures taken to minimize malpractice litigation exposure with EFM could also apply in the use of IA. Simpson and Knox (2003) provide an overview of recurring legal problems associated with EFM use, including failure to accurately assess or appropriately treat deteriorating maternal-fetal status and communication failures within and outside of the perinatal team. Their recommendations include standardized communication and documentation, interdisciplinary education for fetal surveillance, standards to assure competency of care, systems to ensure timely and accurate fetal assessment, appropriate use of intrauterine resuscitation techniques, and organizational systems and resources that support timely interventions. In coordination with Miller's (2015) analysis and the current practice recommendations (ACNM, 2015; Smith et al., 2016), these suggestions emphasize the incorporation of appropriate standards in communication,

documentation, and interdisciplinary training for the minimization of litigation risk.

Moving Forward With Auscultation

Strategies to Promote Implementation of Auscultation

Implementation of IA may require the development or adaptation of policies and procedures to support the requisite philosophy and practice changes within perinatal units. Planning efforts should be interprofessional and collaborative and should address specific requirements for appropriate use of IA including training, technique, and documentation (AAP & ACOG, 2017; AWHONN, 2010; ACNM, 2015; Killion, 2015). These strategies should include engaging birthing women as essential partners in shared decision-making for safe, evidence-based practice (Smith et al., 2016). Several useful resources are available to support the process of incorporating IA. Maude and colleagues (2014) developed a decision-making framework called intelligent structured intermittent auscultation (ISIA), which has been shown to successfully assist with translation of the evidence-based IA into practice by midwives caring for women with low-risk pregnancies. As part of the *Toolkit to Support Vaginal Birth and the Prevention of Primary Cesareans* (Smith et al., 2016), the CMQCC included comprehensive recommendations for the implementation of IA and intermittent EFM (see Box 5).

Rycroft-Malone and colleagues (2004) identified three major factors that influence the implementation of evidence into practice:

- How evidence is viewed and how it fits into an organization's priorities
- The context of the transfer site, and in particular the influence of individuals, project teams, and social networks
- The availability of a dedicated facilitator or opinion leader

Important first steps for increased implementation of IA include discussion of institution-specific enablers and barriers. In addition to the recommendations in Box 5 (Smith et al., 2016), helpful considerations may include the recruitment of multidisciplinary champions, the incorporation of midwifery care, and the celebration of each significant step toward the ultimate goal of practice change.

Research Questions

Although RCTs have concluded that fetal and neonatal outcomes are similar with the use of auscultation or EFM during labor, many questions remain about methods and implementation of IA in labor (e.g., why is IA not used more often during low-risk labors given current evidence). Multiple researchers have addressed this very question (Greene, 2006; Maude et al., 2014; Parer, 2003; Simpson, 2005; Wood, 2003). We need to better understand the complex barriers to and facilitators of IA use in order to fully achieve evidence-based incorporation of IA in perinatal care.

Ongoing and unresolved research topics regarding IA use include further evidence regarding IA technique and best practices; maternal knowledge and preferences; additional outcomes that may be

associated with IA, including its effect on the rate of primary cesarean births; the relationship, if any, between IA use and continuous labor support, including its associated benefits; and the best model for staff education and implementation of an evidence-based IA practice (see Appendix B).

Summary

Intermittent auscultation (IA) is an evidence-based method of fetal surveillance during labor that may be part of an integrated approach to support optimal outcomes for birthing women. Incorporation of IA as a primary technique of fetal surveillance may require organizational and protocol changes, interdisciplinary training and education, consistent clinical practice, staffing changes, and careful attention to documentation and communication around all modes of fetal surveillance. Women and families should be provided with the opportunity to participate in decision-making regarding potential use of IA when appropriate. Regardless of the fetal surveillance method used, shared decision-making and close patient-centered support should be central to the care of laboring women, their fetuses and childbearing families. **NWH**



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APPENDIX A DESCRIPTION OF AUSCULTATION METHODS IN SELECTED RANDOMIZATION CLINICAL TRIALS

Study	Renou et al. (1976)	Haverkamp et al. (1976)	Kelso et al. (1978)	Haverkamp et al. (1979)	Wood et al. (1981)	MacDonald et al. (1985)	Leveno et al. (1986)	Luthy et al. (1987)	Shy et al. (1990)	Vintzileos et al. (1993)	Morrison et al. (1993)	Mahomed et al. (1994)
Auscultation Issues	N = 350 women with high-risk pregnancies	N = 483 women with high-risk pregnancies	N = 504 women; 253 monitored, 251 non-monitored	N = 690 women with high-risk pregnancies	N = 828 women	N = 12,964 women with low- and high-risk pregnancies	N = 34,995 women with low- and high-risk pregnancies	N = 499 women with low- and high-risk pregnancies	N = 189 premature children (26–32 weeks gestation, <1,750 g)	N = 1,428 women with low- and high-risk pregnancies	N = 423 women auscultated from possible 862 Staff nurses	N = 1,255 318 intermittent EFM 312 intermittent Doppler device 310 Pinard stethoscope 315 routine monitoring
Nurse-to-Patient Ratio	Not available	Study nurse in addition to house staff and nurses for auscultation group only 1:1 ratio	No ratio stated	Study nurse in addition to house staff and nurses for both EFM and auscultation groups 1:1 ratio	Staff nurses and physicians No ratio stated	Ratio not available	2:1 ratio	1:1 ratio (study nurse for each group)	1:1 nurse to patient ratio	1:1 ratio for both EFM and auscultation groups	1:1 ratio	Ratio of research midwife not stated
Method of Counting the Fetal Heart Rate	Auscultation without use of the FHR monitor or scalp blood sampling Method not described	Device not described Counting for 30 seconds after uterine contractions	Pinard stethoscope (used intermittent Doppler device if difficulty auscultating with the Pinard) Counted for 1 full minute and during or immediately following a contraction	Device not described Counting for 30 seconds after uterine contractions	Device not described Method not described	Pinard stethoscope (Intermittent Doppler device if difficulty auscultating with the Pinard) Counted for 60 seconds	Handheld Doppler device Method not described	DeLee fetoscope or amplified Doppler device Counted baseline between contractions and at least 30 seconds immediately after contractions	DeLee-Hills fetoscope or amplified Doppler device Baseline FHR obtained between contractions and then 30 seconds immediately after palpated contraction	Doppler ultrasound device Counted baseline for 60 seconds between uterine contractions Palpated maternal pulse	No device described Began during contraction and for 30 seconds after the contraction or for 1 full minute as minimum period of time	FM 10 minutes in every half hour if normal and every 20 minutes if abnormal. Doppler device—last 10 minutes of every half hour, particularly before and after a contraction. Pinard—same routine— Pinard used by a non-research midwife, same protocol

(continued)

APPENDIX A CONTINUED

Study	Renou et al. (1976)	Haverkamp et al. (1976)	Kelso et al. (1978)	Haverkamp et al. (1979)	Wood et al. (1981)	MacDonald et al. (1985)	Leveno et al. (1986)	Luthy et al. (1987)	Shy et al. (1990)	Vintzileos et al. (1993)	Morrison et al. (1993)	Mahomed et al. (1994)
Frequency of Assessment	Not described	q 15 minutes, 1st stage; q 5 minutes, 2nd stage	q 15 minutes or more frequently if indicated	q 15 minutes, 1st stage; q 5 minutes, 2nd stage	Not described	q 15 minutes, 1st stage; every interval between contractions, 2nd stage	At least q 30 minutes	q 15 minutes, 1st stage; q 5 minutes, 2nd stage	q 15 minutes, 1st stage; q 5 minutes, 2nd stage	q 15 minutes, 1st stage; q 5 minutes, 2nd stage	High-risk: q 15 minutes, 1st stage; q 5 minutes, 2nd stage Low-risk: q 30 minutes, 1st stage; q 5 minutes, 2nd stage	See above
Definition of Nonreassuring Fetal Heart Rate	Not described	Heart rate <100 bpm after 3 or more uterine contractions despite corrective measures	FHR >160 bpm or <120 bpm	Heart rate <100 bpm after 3 or more uterine contractions despite corrective measures Fetal tachycardia >160 bpm Fetal bradycardia 100–120 bpm Irregular heart rate	Not described	FHR >160 bpm or <100 bpm without change after intervention	Not described	FHR 100–120 bpm or 160–180 bpm after auscultation q 5 minutes until normal More ominous is <100 bpm persisting >30 seconds after contractions, baseline >180 bpm for 15 minutes, and <100 bpm for 60 seconds (Reassuring is 120–160 bpm)	Either classified as reassuring or abnormal; persistence of abnormal rate for more than 30 minutes in absence of correctable cause indication for forceps or CS	Heart rate during and immediately after auscultation <100 bpm repeated even with recovery to 120–160 bpm before contraction	Not described	Abnormalities in the FHR; prolonged or late decelerations in EFM group

(continued)

APPENDIX A CONTINUED

Study	Renou et al. (1976)	Haverkamp et al. (1976)	Kelso et al. (1978)	Haverkamp et al. (1979)	Wood et al. (1981)	MacDonald et al. (1985)	Leveno et al. (1986)	Luthy et al. (1987)	Shy et al. (1990)	Vintzileos et al. (1993)	Morrison et al. (1993)	Mahomed et al. (1994)
Outcomes	EFM group Increased CS rate Improved pH, pO ₂ , pCO ₂ values Auscultation group Increased NICU admits No difference in Apgar scores	EFM group Increased CS rate Increased infection rate No difference in neonatal outcomes	No difference in Apgar scores < 6 at 1 minute, neonatal deaths, maternal and neonatal morbidity, cord blood gases Significant increase in CS in monitored group	EFM group Increased CS rate No difference in perinatal outcomes (Note: very LBW & preemies excluded)	EFM group Increased CS rate No difference in neonatal outcomes	No difference in low Apgar scores, need for resuscitation, transfer to NICU; Auscultation group Increased neonatal seizures	EFM group Increased CS rate Increased recognition of abnormalities in FHR patterns No difference in neonatal outcomes	No difference in low 5-minute Apgar scores, intrapartum acidosis, intercranial hemorrhage, or frequency of CS	No difference in Apgar scores, arterial cord blood pH values Incidence of cerebral palsy higher in the EFM group: The risk of cerebral palsy increased with the duration of abnormal FHR patterns (retrospective study) From onset of abnormal FHR to birth longer in EFM group CS rate not significantly different between EFM and IA groups	EFM group Increased nonreassuring patterns Increased CS and operative rate and Pitocin use Auscultation group Higher number of perinatal deaths No difference in neonatal outcomes, Apgar scores, NICU admits, neonatal resuscitation	Focus of study was on the success rate in auscultation 420 women not included related to lack of 1:1 ratio 392 of the 423 enrolled did not complete the labor with auscultation (212, frequency not adequate; 163, documenting not adequate; 17, for other reasons)	No difference in Apgar scores Seizures only occurred in the Pinard and routine groups Significantly fewer NICU admissions in the Doppler device group as compared to the Pinard groups No difference in EFM and Doppler device group for seizures

Note. EFM = electronic fetal monitoring; FHR = fetal heart rate; LBW = low birth weight; CS = cesarean section; FM = fetal monitoring.

APPENDIX B RESEARCH QUESTIONS RELATED TO IA

Technique	What is the optimal frequency for assessing the FHR with IA during labor?
	What is the optimal duration of counting the FHR to establish baseline rate?
	What is the optimal method for counting to establish FHR changes from baseline?
	Does counting during versus after a contraction result in different outcomes?
Maternal Knowledge and Preferences	What is the best technology to use when performing IA?
	What constitutes adequate informed consent related to the choice of fetal surveillance methods?
	What factors influence women's preferences for monitoring during labor?
	Would a decision-making tool for women facilitate their participation in decisions about the type of fetal surveillance used during their labor?
Labor Support	How can we incorporate information on IA into the prenatal education our patients receive?
	Is the use of IA related to increased nurse support of women in labor, and what are the related outcomes?
	Do women perceive increased support from nurses using the IA method?
Staffing Issues	What staffing models best support the implementation of IA?
	Does a 1:1 nurse-to-mother ratio for IA result in cost savings beyond the costs associated with staffing issues?
IA Education	What is the best method for teaching IA?
	What is the best method for evaluating competency in performing IA?
	What is the optimal frequency for assessing competency in performing IA?
Evidence-Based Practice Implementation	What is the decision-making process used by providers in deciding whether to implement IA during low-risk labor?
	What are the intra- and inter-provider reliability of assessments of auscultated fetal heart characteristics?
	What are the facilitators and barriers to successful IA implementation?
	What are the best strategies for addressing barriers to implementation?
	What innovative strategies for implementation of IA are most effective?
Other Outcomes	Is there an impact on women's satisfaction with the use of IA?
	Are the perinatal outcomes different when auscultating at longer frequencies?
	What are the neonatal outcomes when IA is implemented vs EFM?