FETAL HEART RATE AUSCULTATION

4TH EDITION

Kirsten Wisner, PhD, RNC-OB, CNS, C-EFM, NE-BC

Carrie Holschuh, PhD, CNM, WHNP, RN

AWHONN
PROMOTING THE HEALTH OF
WOMEN AND NEWBORNS

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ABOUT AWHONN

Headquartered in Washington, DC, the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) is a leader among the nation's nursing associations, serving more than 25,000 health care professionals in the United States, Canada, and abroad and representing more than 350,000 nurses in our specialty.

AWHONN advances the nursing profession by providing nurses with critical information and support to help them deliver the highest quality care for women and newborns. Through its many evidence-based education and practice resources, legislative programs, research, and coalition work with other organizations and associations, AWHONN has firmly established itself as the leading association for women's health, obstetric, and neonatal nurses.

AWHONN members strive to deliver superior health care to childbearing families and newborns in hospital, home health, and ambulatory care settings. The rich diversity of members' skills and experience makes AWHONN the *voice* for women's health and neonatal nursing. It is through their dedication, knowledge, skill, and expertise that we create resources aimed at achieving our mission to promote the health of women and newborns.

AWHONN recognizes the existence of diverse gender identities and acknowledges that patients may not identify as women, exclusively or otherwise. AWHONN strives to use gender-inclusive language in its educational materials where possible. In some instances, words like "women" (and related pronouns "she" and "her") have been retained for accuracy (e.g., to preserve the terminology of a published study) and specific case scenarios. To provide appropriate, respectful, and sensitive care, the healthcare provider is encouraged to always ask individuals what words they use to describe themselves, their bodies, and their healthcare practices.

This education guide was developed for AWHONN as a resource for nursing practice. It does not define a standard of care and is not intended to dictate an exclusive course of patient management. It is based on current research and guidelines from recognized authorities at the time of production and presents general methods and techniques of clinical practice that AWHONN believes to be currently and widely viewed as acceptable.

This information is not meant or intended to serve as a substitute for professional judgment. Proper patient care depends on several factors that should be considered according to the needs of each patient in clinical practice. Participants are encouraged to use variations or innovations that are consistent with individual state law and facility rules and that demonstrably improve the quality of patient care.

AWHONN believes any drug classifications and product selection in this resource are in accordance with current recommendations and practice at the time of publication. However, due to ongoing research, changes in government regulations, and the constant flow of information related to health care, the participant is urged to check information for each drug in other current and authoritative sources to identify any potential changes in practices, indications, dosages, warnings, and precautions. Appropriate medication use may depend on unique factors such as the patient's health status, additional medications, and other factors that the interprofessional team must consider in clinical practice.

The information presented here is not designed to define standards of practice for employment, licensure, discipline, legal, or other purposes. Participants should refer to their facility's policies and protocols for specific requirements and guidelines for patient care.

Table of Contents

Fetal Heart Rate Auscultation, 4th Edition

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ABSTRACT

Intermittent auscultation (IA) is an evidence-based method of fetal surveillance during labor for birthing people with low-risk pregnancies. It is a central component of efforts to reduce the primary cesarean rate and promote vaginal birth (American College of Obstetricians and Gynecologists, 2019; Association of Women's Health, Obstetric and Neonatal Nurses, 2022a). The use of intermittent IA decreased with the introduction of electronic fetal monitoring, while the increased use of electronic fetal monitoring has been associated with an increase of cesarean births. This practice monograph includes information on IA techniques; interpretation and documentation; clinical decision-making and interventions; communication; education, staffing, legal issues; and strategies to implement IA.
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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 (Drummond & Rust, 2021). In the fourth 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 the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) *Fetal Heart Monitoring Principles and Practices* (6th ed., O'Brien-Abel, 2021) 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

IA as a Routine Option for Low-Risk Birth

Professional associations identify IA as an acceptable method of fetal surveillance during active labor for low-risk birth (American Academy of Pediatrics [AAP] & American College of Obstetricians and Gynecologists [ACOG], 2017; American College of Nurse-Midwives [ACNM], 2015; ACOG, 2009, 2019a; AWHONN, in press). The Joint Commission (TJC; 2022a) and ACOG (2019a) recommend that IA should be routinely offered as an option during shared decision-making with low-risk patients, and ACNM (2018) recommends that IA should be the standard of care in low-risk birthing populations. Increasing the use of IA for low-risk patients is recommended to help reduce primary cesarean births and operative vaginal births by promoting spontaneous vaginal birth (Al Wattar et al., 2021; Alfirevic et al., 2017; Blix et al., 2019; Cox & King, 2015). Increased use of IA is a featured strategy in the California Maternal Quality Care Collaborative Toolkit to Support Vaginal Birth and Reduce Primary Cesareans (H. Smith et al., 2016) and the ACNM Healthy Birth Initiative: Reducing Primary Cesarean Births Project (ACNM, 2022a). Facilitators to promote implementation of IA include strong interprofessional leadership in support of IA guidelines, inclusion of staff in decision-making, involvement of nurses and midwives in the establishment of IA guidelines, comprehensive education on the use of IA, bundling IA with other measures to support vaginal birth, and the presence of midwives and nurses on the unit who are comfortable using IA (Blix et al., 2019; Gams et al., 2019; Graham et al., 2014; Heelan, 2013; Hersh et al., 2014; Javernick et al., 2021; Jepsen et al., 2022; Lundsberg et al., 2020; Romano & Buxton, 2020; H. Smith, 2017; Snelgrove-Clarke & Scott-Findlay, 2005).

Considerations for Offering IA

Rapid increase in the use of electronic fetal monitoring (EFM) initially exceeded the pace at which research could measure its effectiveness (Heelan, 2013; Sherrod, 2021). The original clinical trials comparing EFM to IA in low-risk births showed no significant benefit of using EFM (Banta & Thacker, 2001; Evans et al., 2022; Schifrin et al., 2022). Twelve randomized clinical trials (RCTs) published between 1976 and 1994 and subsequent meta-analyses and systematic reviews also failed to demonstrate significant benefit of EFM when compared to IA (Al Wattar et al., 2021; Alfirevic et al., 2006; Anderson, 1994; Blix et al., 2019; Grant, 1992; Housseine et al., 2018; Neilson, 1994a, 1994b, 1994c; Small et al., 2020; Thacker et al., 1995, 1998, 2006; Vintzileos et al., 1995; please see Appendix A for a review of the foundational literature underpinning current IA practice). While IA cannot reliably differentiate between types of decelerations or identify moderate heart rate variability, when correctly used IA is equivalent to EFM in determining long-term neonatal outcomes (ACNM, 2015; Alfirevic et al., 2017). The presence of moderate variability, which can only be assessed using EFM, had been considered a reliable indicator of the absence of fetal metabolic acidemia (Macones et al., 2008). However, moderate variability may not be as reliable as previously thought to rule out fetal metabolic acidemia (Cahill et al., 2012; Clark et al., 2017; Kiely, 2018).

Some research has shown limited benefits to EFM in detecting fetal acidemia (Parer et al., 2006) and cord blood metabolic acidosis (Elliott et al., 2010). Other studies have shown a slightly higher risk for neonatal seizures for newborns whose parents received IA. 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 (Alfirevic et al., 2017; Graham et al., 2006). Additionally, the use of EFM upon labor admission, when compared with IA, increased risk of cesarean and operative vaginal birth in low-risk pregnancies (Al Wattar et al., 2021; 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. Because these conclusions are based primarily on older trials conducted under significantly different conditions than today, it is difficult to know to what degree use of IA might decrease cesarean or operative vaginal birth rates (Tommaso et al., 2019).

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, 2017; Devane et al., 2012, 2017; Grant, 1992; Neilson, 1994a, 1994b, 2015; Thacker et al., 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 consistently illustrated an increased rate of cesarean and operative vaginal births with EFM (East et al., 2014). EFM significantly reduces the patient's mobility during labor when compared to IA (Blix et al., 2019; Romano & Buxton, 2020).

A History of How IA Came to Be Underutilized in Clinical Practice

While external and internal EFM are currently in much greater use than IA, this was not always the case. EFM, also known as cardiotocography, denotes the simultaneous electronic monitoring of FHR and uterine contractions. Historically, assessment of 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 technological capacity to capture a record of continuous FHR data made EFM seem intuitively superior to the intermittent IA data collected by skilled practitioners (ACOG, 2019a; Ayers-de-Campos et al., 2019; Sherrod, 2021). It was theorized, for example, that the use of continuous EFM could help identify fetal acidemia, prevent fetal deaths, and decrease the incidence of cerebral palsy (Greene, 2006; Hersh et al., 2014; Neilson, 1994c). Over time, the increasing availability of EFM resulted in decreased use or elimination of IA for fetal surveillance (Larry-Osman, 2021). An accompanying decline in familiarity with IA techniques further marginalized IA as a method of EFM. In many settings, practitioners' experience and comfort levels with IA techniques may remain a barrier to use (Hersh et al., 2014; Kinikanwo et al., 2022; Romano & Buxton, 2020).

Routine use of EFM was subsequently linked to increases in operative vaginal birth and cesarean birth rates without an accompanying decrease in perinatal mortality or the incidence of childhood morbidity (Al Wattar et al., 2021; Alfirevic et al., 2013, 2017; Heelan-Fancher et al., 2019; Housseine et al., 2018; Small et al., 2020). The increasing rate of cesarean births can increase mortality and morbidity for the birthing person, such as an immediate risk of hemorrhage or a risk of morbidly adherent placenta in future pregnancies (ACOG, 2014; Gams et al., 2019; Main et al., 2012). The increasing cesarean rate may also contribute to short- and long-term health problems for which children born by cesarean have an increased risk (Peters et al., 2018; Sandall et al., 2018).

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. laboring patients had EFM (Albers & Krulewitch, 1993). By 1992, EFM was used in nearly 75% of labors (Thacker et al., 1998). The use of EFM during labor increased from 83% of live births for patients in the 1990s (Haggerty, 1999; Ventura et al., 1998) to more than 90% of laboring patients in the 2000s (Declercq et al., 2013b). In a 2013 survey, 23% of U.S.

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laboring patients reported that IA was used in combination with intermittent or continuous EFM during their labor. Of the 89% of patients who reported some EFM use during their labors, 80% reported that EFM was continuous or used "most of the time" (Declercq et al., 2013a, p. 85). Most recently, the Listening to Mothers in California survey found that, from a sample of 1,964 patients, only 19.4% reported they had any IA during labor and only 3% reported they had IA as the only fetal surveillance method used during their labor (Sakala et al., 2020).

Translating Research Into Practice

Commonly cited barriers to implementation of IA for low-risk labor include medicolegal concerns; lack of medical or administrative support; clinical unit culture and interprofessional communication; lack of sufficient equipment, such as enough Doppler devices; the presence of an EFM in most labor rooms; limited financial resources and staff; the need to provide initial and continuing education 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 (Chuey et al., 2020; Graham et al., 2014; Greene, 2006; Haggerty, 1999; Heelan, 2013; Hersh et al., 2014; Hindley et al., 2006; Housseine et al., 2019, 2020; Kinikanwo et al., 2022; Klein et al., 2006; Maude et al., 2014; L. A. Miller, 2015; Morrison et al., 1993; Parer, 2003; Patey et al., 2017; K. R. Simpson, 2005; Supplee & Vezeau, 1996; Wood, 2003). Another barrier to implementation has been the lack of a single consensus-based protocol for use of IA (Blix et al., 2019; Housseine et al., 2019; Kinikanwo et al., 2022; Romano & Buxton, 2020; Sholapurkar, 2022). There is a continuing need for greater understanding of the complex factors involved in the decision-making process of patients 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, including adherence to IA guidelines (Rossett et al., 2020). 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; L. A. Miller, 2015; Sakala et al., 2020; Wood, 2003). Birthing people in marginalized social groups in the United States, for example, Indigenous peoples and people of color, have been found to experience less access to shared decision-making in labor, most especially Black women who give birth by cesarean (Attanasio et al., 2018), and increased rates of mistreatment during labor and birth (Vedam, Stoll, Taiwo et al., 2019). At the same time, the primary cesarean rate in the United States continues to rise, most recently to 22.4% in 2021, and is increasing for Hispanic-origin and most non-White groups (Osterman, 2022). Adequate shared decision-making that routinely includes IA may be one strategy to help address these inequities.

Consumer-oriented childbirth education sources have been found to give incomplete and confusing information regarding fetal surveillance options in labor and present EFM as the standard of care (Torres et al., 2014). Although it has been hypothesized that patients may prefer the comfort of hearing the FHR with EFM during labor (Parer, 2003), there is a lack of research on patient preferences (Priddy, 2004; Wood, 2003). A recent study reaffirmed that patients value autonomy in decision-making regarding their care (Vedam, Stoll, McRae et al., 2019). 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 pregnant person, their family, and their health care provider (Alfirevic et al., 2013, 2017; Devane et al., 2012, 2017; Grant, 1992; Neilson, 1994a, 1994b, 2015; Thacker et al., 2001).

Auscultation Devices

The listening devices available to perform IA 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 detect the FHR (Martis et al., 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, stethoscopes used to auscultate heart, lung, or bowel sounds can be used to listen to the fetal heart. The Pinard fetoscope, named after the French physician credited with its development, is a monoaural (i.e., one ear), wood or metal trumpet-shaped device that is used to directly hear the opening and closing of the fetal ventricular heart valves (Blix et al., 2019; Maude et al., 2010). Sometimes called a Pinard horn, the device's larger end is placed on the pregnant abdomen and the smaller end to the clinician's ear (Martis et al., 2017). Also named after its developers, the DeLee–Hillis fetoscope is a binaural (i.e., both ears) device consisting of a stethoscope combined with a fetoscope, like the Pinard. The smaller end of the fetoscope is placed on the clinician's forehead, often secured via a metal headband, instead of the ear, 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. While most handheld Dopplers are battery operated, wind-up devices have been developed that may be especially useful in low-resource settings (Ayres-de-Campos et al., 2019). 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. Note that EFM systems may automatically archive data, even when the paper tracing is turned off, and such passive data capture should be addressed when developing institutional policies related to risk management and documentation.

Use of the EFM Ultrasound Transducer for Auscultating the FHR. In clinical practice, the EFM ultrasound transducer is sometimes used to obtain FHR information, and a protocol using this method has been proposed (H. Smith et al., 2016). However, due to limited evidence to support this practice AWHONN (2022c)

TABLE 1 FHR 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 FHR and heart rate of birthing person	Yes	May detect heart rate of birthing person	May detect and record heart rate of birthing person

Note. FHR = fetal heart rate. From "Intermittent Auscultation for Intrapartum Fetal Heart Rate Surveillance," by American College of Nurse-Midwives, 2015, *Journal of Midwifery & Women's Health*, *60*, p. 627. Copyright 2015 by the American College of Nurse-Midwives. Used with permission.
[a]Definitions of each FHR characteristic are based on those reported in Macones et al. (2008).
[b]Per the method described by Paine, Johnson, Turner & Payton (1986) and Paine, Payton, and Johnson (1986).
[c]Determined as regular or irregular. None of these devices can diagnose the type of fetal arrhythmia.

does not recommend using the EFM ultrasound transducer to obtain FHR information for IA. Only one study has compared outcomes between intermittent EFM and IA using a Doppler-type device or a Pinard stethoscope (Mahomed et al., 1994), and its findings should be applied with caution because of methodologic concerns (Martis et al., 2017).

Benefits and Limitations of Auscultation Devices

Comparisons of fetal and maternal outcomes in patients monitored using different auscultation devices (e.g., Pinard stethoscope, handheld Doppler, intermittent monitoring with an EFM ultrasound transducer) have been reported in two meta-analyses (Blix et al., 2019; Martis et al., 2017). Findings suggest 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 the standard Pinard (Martis et al., 2017). The handheld Doppler and intermittent EFM detected more early and late FHR decelerations than the Pinard, and patients monitored via Doppler had higher rates of cesarean birth than those monitored with a Pinard (Martis et al., 2017). No clear differences in neonatal outcomes (e.g., low 5-minute Apgar scores or seizures) or perinatal mortality were detected among groups (Martis et al., 2017). Blix and colleagues (2019) also found higher rates of abnormal FHR patterns in patients monitored by Doppler devices compared to the Pinard, with no differences in maternal and fetal outcomes.

Devices using ultrasound technology such as the Doppler device or EFM transducer may detect an irregular rhythm, but only an experienced practitioner using 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 the birthing person's heart rate instead of the FHR; hence, the birthing person's pulse should be checked when auscultating using ultrasound technology to differentiate the birthing person's heart rate from the 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 et al., 2015). Half-counting may occur at FHRs above 210 beats per minute (bpm) and double-counting with FHRs below 50 bpm. A fetoscope should be used to clarify the FHR.

Advantages of the fetoscope are its low cost and the ability to implement it in all settings (Blix et al. 2019). Limitations of the fetoscope may include patient discomfort from the abdominal pressure often required to hear the FHR (Blake, 2008) and the fact that practitioners may not be proficient using it because of the widespread use of Doppler and EFM technology. Advantages of Doppler devices are that they can detect the FHR in various positions and can be heard by everyone present during the assessment. Disadvantages are that they cost more than the fetoscope and require batteries and replacement parts (Blix et al., 2019; see Table 1).

Auscultation Procedure

Background of Auscultation Procedures

No studies have compared outcomes using different auscultation protocols. Various methods and techniques have been recommended by professional organizations (ACNM, 2015; Drummond & Rust, 2021; Lewis & Downe, 2015), and these are typically modeled after

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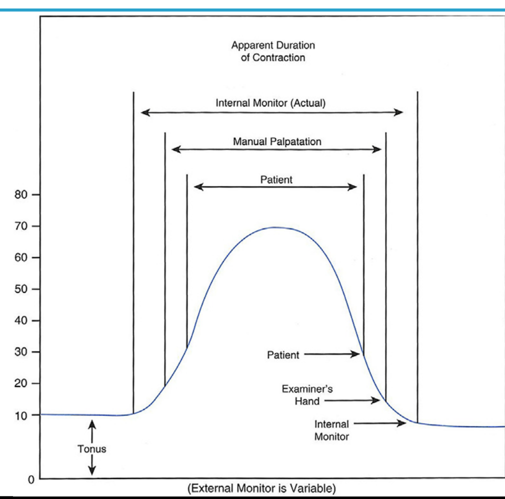
protocols used in RCT studies comparing EFM to IA. Methods have included listening to the FHR at set intervals, presumably to determine the FHR baseline and auscultating during and/or after a contraction (Kelso et al., 1978; Luthy et al., 1987; Neldam et al., 1986; Shy et al., 1990; Vintzileos et al., 1993) as well as auscultating during and/or after a contraction (Haverkamp et al., 1976, 1979; Morrison et al., 1993) or before and after a contraction (Mahomed et al., 1994).

There are very limited data evaluating the accuracy of palpation of uterine contractions by comparing clinician estimates with intrauterine pressure readings (Arrabal & Nagey, 1996; Caldeyro-Barcia & Poseiro, 1960). 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' assessments by palpation were aligned with intrauterine pressure readings about half the time. 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. Results have been inconsistent, with some studies reporting that clinicians underestimated the FHR baseline (N. Simpson et al., 1999) or were inaccurate 20% of the time (Day et al., 1968). Other studies found that clinicians accurately assessed FHR baseline (F. C. Miller et al., 1984; Strong & Jarles, 1993), FHR accelerations (F. C. Miller et al., 1984; O'Leary et al., 1980; Paine, Johnson, Turner, & Payton, 1986), the presence of decelerations (F. C. Miller et al., 1984), and the duration and nadir of decelerations (Strong & Jarles, 1993). Clinicians were less accurate in detecting variability and salutatory patterns (F. C. 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 maneuvers to help assess fetal lie to identify the optimal location for auscultating the FHR.

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



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

Leopold Maneuvers

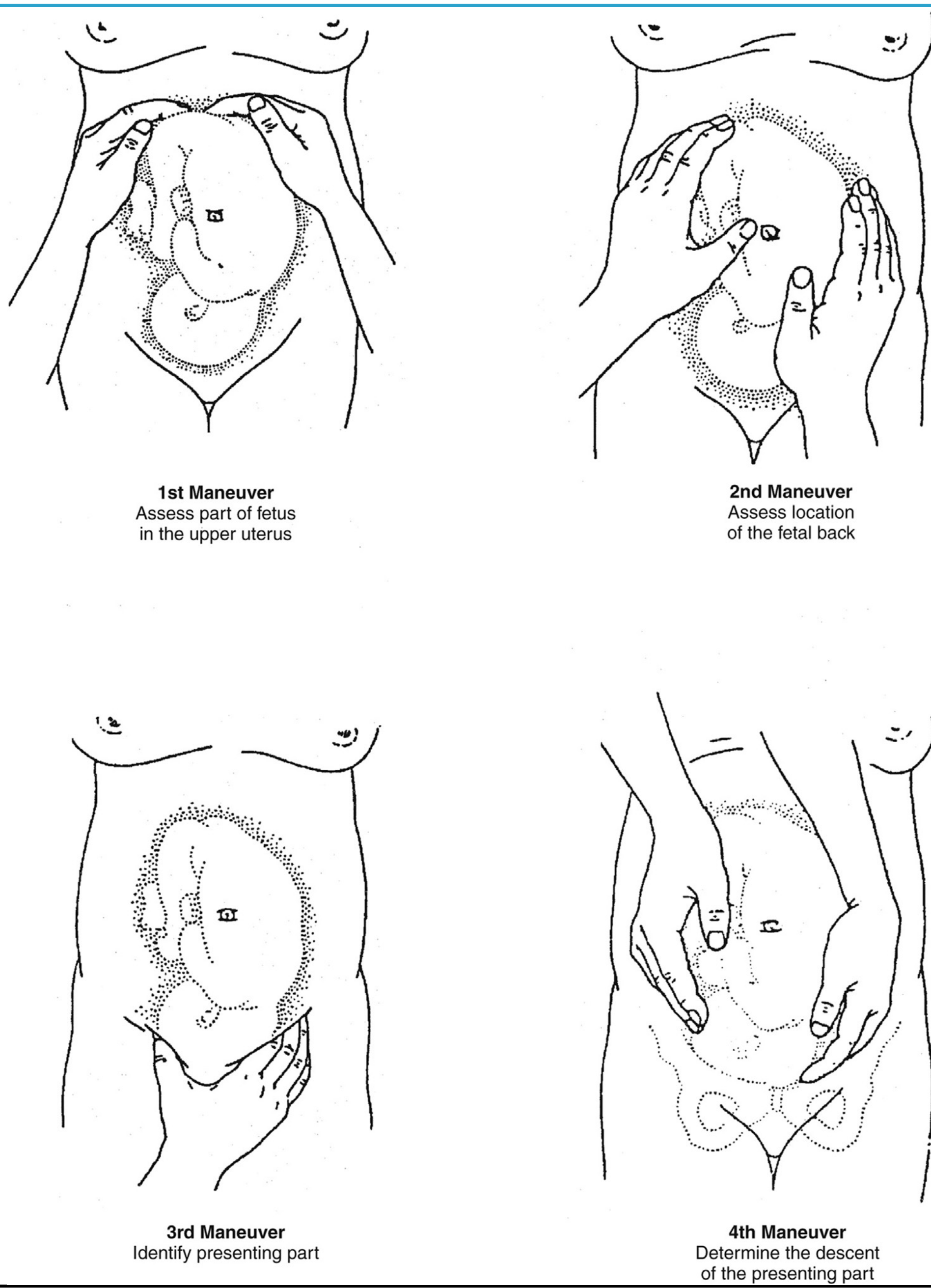
Leopold maneuvers include four steps to determine fetal lie, presentation, position, and the optimal location for placement of the auscultation device (King et al., 2019; see Figure 2). Before starting, ask the birthing person if they would like to void. Then, assist them to a comfortable position lying supine with the 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 birthing person's side, facing them, and palpating the upper part of the uterus. The buttocks will likely feel firm and immobile, whereas the head will feel round, hard, and ballottable.

Second maneuver. Locate the fetal back by placing a 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 birthing person'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 birthing person, place the finger(s) and the thumb of one hand pointing upward toward the birthing person'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

FIGURE 2 LEOPOLD MANEUVERS



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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 birthing person's feet and placing both hands on either side of their uterus; then, move the hands toward the pelvic brim. Only a small portion of the head will be palpable if fully 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.

IA 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

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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 et al. (1989).

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 & Ivory, 2021; see Table 2).

FHR Assessment

The auscultation technique outlined below includes assessing the FHR baseline between contractions and assessing for periodic changes of the FHR by listening during the latter part of a contraction and for 30 seconds afterward at each specified assessment interval. The recommended technique is described as follows.

FHR baseline. Once uterine activity and fetal lie have been assessed, the next step is to listen to the FHR. Evaluate the patient's heart rate to compare to the FHR and ensure accurate assessment. 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 the 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 15 to 60 seconds, between contractions, and documenting the FHR baseline as a single number representing an average of the auscultated FHR during that interval (see Table 3 for a description of the complete auscultation procedure).

Periodic changes. The next step is to auscultate for periodic changes of the FHR such as accelerations (increases) and decelerations (decreases). While accelerations and decelerations should be noted when they are detected during contractions, listening to the FHR during a contraction may be challenging because of the birthing person's movement and vocal expression. As part of a systematic assessment, experts recommend listening during the last part of a contraction and for at least 15 to 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 nonrecurrent should also be documented (ACNM, 2015).

Most RCTs comparing EFM and IA used a single-count strategy and assessed the baseline between uterine contractions and/or auscultated during and after a contraction; hence, there are limited data to support adjunctive techniques. While this is not the method recommended in this guideline, 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, Johnson, Turner, & Payton, 1986; Paine, Payton, & Johnson, 1986) and to propose and test an auscultated nonstress test as an alternative to a nonstress test obtained via EFM (Paine et al., 1988; Paine, Johnson, Turner, & Payton, 1986). This counting method involved auscultating the FHR continuously for 3 to 6 minutes and recording findings obtained from every other 5-second auscultation period (Paine, Johnson, Turner, & Payton, 1986; Paine, Payton, & Johnson, 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. Schifrin and colleagues (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, this is the only study found supporting 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 birthing people every 15 to 30 minutes in active labor and at least every 15 minutes in the second stage of labor (AAP & ACOG, 2017; ACNM, 2015; AWHONN, in press). Low risk has been defined as individuals who have

> no meconium staining, intrapartum bleeding, or abnormal or undetermined fetal test results before birth or at initial admission; no increased risk of developing fetal acidemia during labor (e.g., congenital anomalies, intrauterine growth restriction); no maternal condition that may affect fetal well-being (e.g., prior cesarean scar, diabetes, hypertensive disease); and no requirement for oxytocin induction or augmentation of labor. (AAP & ACOG, 2017, p. 239).

TABLE 3 AUSCULTATION PROCEDURE

Procedure	Rationale
1. Explain the procedure to the birthing person and their support person(s) and ask for permission to proceed.	1. Allays fears and anxiety; offers opportunity for emotional and informational support
2. Assist the birthing person to a semi-Fowler's or wedged lateral position.	2. Prevents supine hypotension syndrome and promotes comfort
3. Palpate the abdomen and perform Leopold 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 the 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 birthing person's radial pulse if using a Doppler device or ultrasound transducer.	7. Differentiates the birthing person's 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 after uterine contractions for at least 30 to 60 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. bpm = beats/minute; FHR = fetal heart rate. From "Fetal heart rate auscultation, 3rd edition," by K. Wisner and C. Holschuh, 2018, *Nursing for Women's Health*, *22*(6), p. e7. Copyright 2018 by the Association of Women's Health, Obstetric and Neonatal Nurses.

Low risk has been more simply defined as a clinical situation where there is no clear benefit for a medical intervention (ACOG, 2019a). Interventions should be chosen to ensure clinical safety and support patient preferences (ACOG, 2019a). AWHONN recommends distinguishing between passive descent and active pushing during the second stage of labor when determining frequency intervals for assessment (AWHONN, in press; see Table 4). The FHR should also be assessed after rupture of membranes, patient position changes, scalp stimulation, or vaginal examination (ACNM, 2015).

IA for the 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 EFM not be used on admission for low-risk patients. Admission EFM assessment does not improve neonatal outcomes and may lead to increased interventions such as cesarean birth. 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). A recent RCT that included 3,034 patients compared outcomes in patients randomized to an admission EFM to those assessed by IA and found no statistically significant differences between groups in cesarean birth, rates of labor interventions (other than the use of EFM), and neonatal outcomes (V. Smith et al., 2019). The use of IA for an admission assessment is supported in several professional guidelines outside of the United States, while other guidelines have not provided guidance for its use in this context (Blix et al., 2019). Given the general agreement that IA is an appropriate method of fetal assessment in low-risk pregnancies, it may be reasonable to extend support of the IA method to the initial

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TABLE 4 ASSESSMENT AND DOCUMENTATION OF FETAL STATUS USING INTERMITTENT AUSCULTATION[a,b]

	First Stage of Labor		Second Stage of Labor	
	Onset of Labor to 4-cm Dilation	4 cm to 10 cm (Complete Dilation)	Complete Dilation (Passive Fetal Descent)	Complete Dilation (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 minutes	Every 5–15 minutes

Note. From "Fetal Heart Monitoring [Position statement]," by Association of Women's Health, Obstetric and Neonatal Nurses, in press. Copyright (in press) by the Association of Women's Health, Obstetric and Neonatal Nurses.
[a]Frequency of assessment should always be determined based on the status of the woman 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.
[b]Summary documentation is acceptable, and individual hospital policy should be followed.

admission assessment and offer this choice to birthing people presenting in labor (Blix, 2013).

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). K. R. Simpson (2021) 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 birthing person, medical history, and condition as well as the trajectory of medical care. It provides data about the birthing person's care to other clinicians; payers; regulatory agencies; accrediting bodies; researchers; and, in certain cases, the legal system (American Nurses Association, 2010).

Each institution should develop interprofessional policies, procedures, and protocols that clearly outline expectations and responsibility for FHM assessment and documentation. These 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, in press). 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 writers develop organizational policies to maximize and support nurses' autonomy and clinical judgment and limit unnecessary documentation burdens to support nurses' ability to provide continuous labor support (L. Miller, 2011; H. Smith et al., 2016).

Documentation should be contemporaneous, accurate, objective, and efficient and should include the following: an admission assessment of the birthing person and their 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 birthing person and their support persons, communication with other clinicians, and any communication within the chain of command (AWHONN, in press). Documentation of the FHR category is considered optional and should be addressed in institutional policy

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	

Note. FHR = fetal heart rate; IA = intermittent auscultation.

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

- What is the baseline rate and rhythm?
- 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?
- Does the FHR pattern suggest an acute or chronic maternal–fetal condition?
- 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. FHR = fetal heart rate; IA = intermittent auscultation. From "Physiologic Interventions for Fetal Heart Rate Patterns," by K. R. Simpson, in A. Lyndon and K. Wisner (Eds.), *Fetal Heart Monitoring Principles and Practices* (6th ed.), 2021, p. 159. Copyright 2021 by the Association of Women's Health, Obstetric and Neonatal Nurses.

(AWHONN, in press; Lyndon & Zlatnik, 2021; Wisner & Ivory, 2021).

Frequency of Assessment and Documentation

Professional organizations offer recommendations regarding the frequency of uterine and FHR assessment and documentation when using IA (AAP & ACOG, 2017; ACNM, 2015; AWHONN, in press). 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 patients 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, patient position changes, or fetal scalp stimulation (ACNM, 2015). IA findings should be documented at the time of assessment since there is no archived fetal monitoring tracing (AWHONN, in press).

Uterine Activity

The documentation of uterine activity using IA should capture 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 & Ivory, 2021).

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 that reflects an average of the FHR over the interval auscultated, without rounding to the nearest 5-bpm increment. A normal baseline FHR is between 110 and 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 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 birthing person's pulse should be assessed when using a Doppler or other ultrasound device to perform IA to distinguish it from the FHR since blood flow through the umbilical cord or placenta may be detected with auscultation devices (Wisner & Ivory, 2021).

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 if they are recurrent or nonrecurrent (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 FHR Characteristics

The National Institute of Child Health and Human Development three-tiered nomenclature (Macones et al., 2008) has been adapted for IA (Lyndon & O'Brien-Abel, 2021). Category I auscultated FHR characteristics are considered normal and include a normal FHR baseline (110–160 bpm), a regular rhythm, the presence or absence

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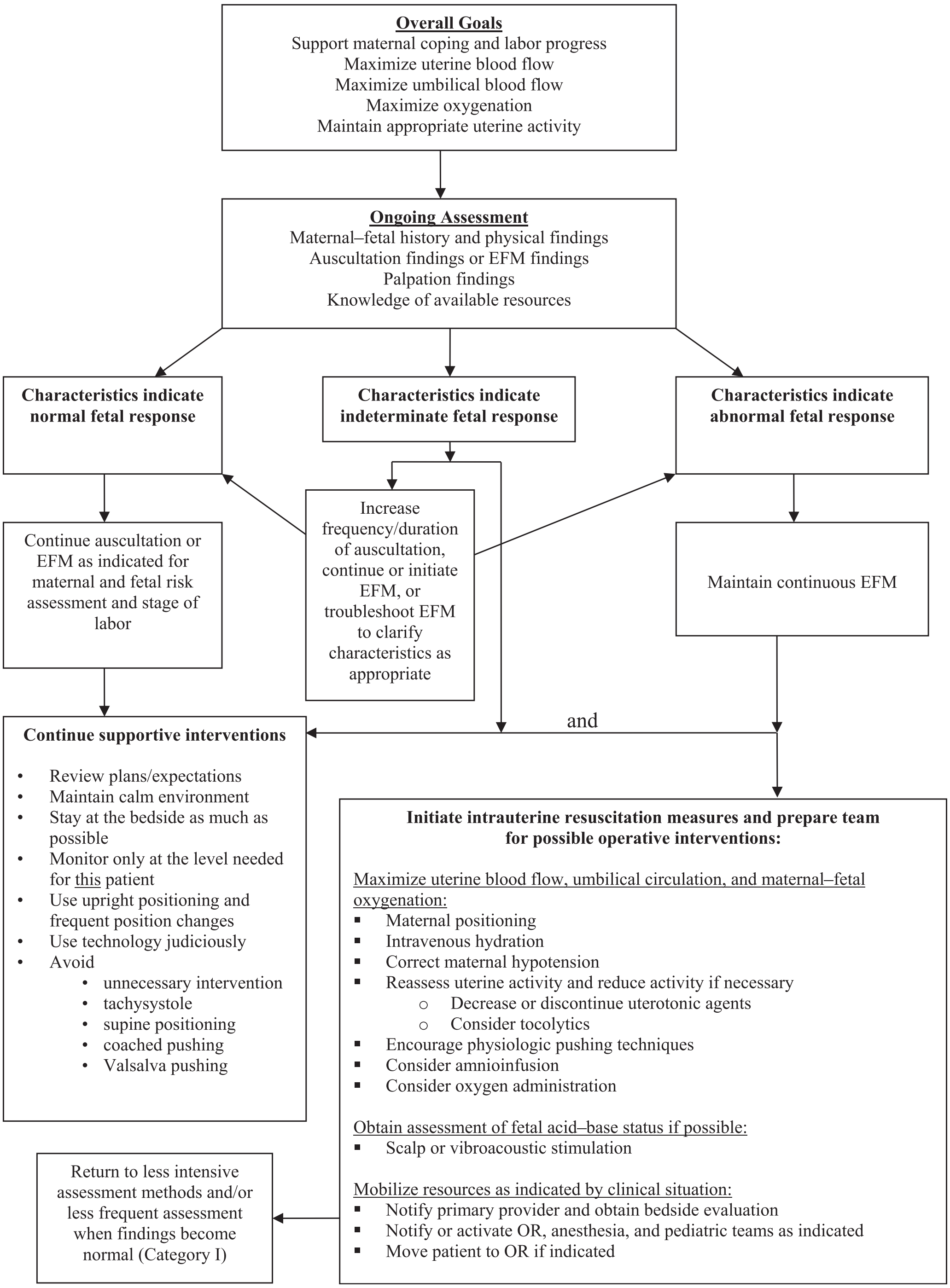
FIGURE 3 FETAL MONITORING DECISION TREE

Fetal Heart Rate Auscultation



Note. EFM = electronic fetal monitoring; IA = intermittent auscultation; OR = operating room. From "Fetal Heart Rate Interpretation," by A. Lyndon and N. O'Brien-Abel, in A. Lyndon and K. Wisner (Eds.), *Fetal Heart Monitoring Principles and Practices* (6th ed.), 2021, p. 148. Copyright 2021 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 of >160 bpm for >10 minutes in duration)
- Bradycardia (baseline of <110 bpm for >10 minutes in duration)

Note. bpm = beats/minute; FHR = fetal heart rate. From "Fetal Heart Rate Interpretation," by A. Lyndon & N. O'Brien-Abel, in A. Lyndon and K. Wisner (Eds.), *Fetal Heart Monitoring Principles and Practices* (6th ed.), 2021, p. 149. Copyright 2021 by the Association of Women's Health, Obstetric and Neonatal Nurses.

of FHR accelerations from baseline, and the absence of decelerations from baseline (Lyndon & O'Brien-Abel, 2021). 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, which requires visual evaluation and thus cannot be assessed using IA (Lyndon & O'Brien-Abel, 2021).

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

Clinical Decision-Making and Interventions

The assessment, interpretation, and evaluation of FHM information requires multidimensional clinical skills that develop over time. Nurses should include birthing people 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 FHM model (see Figure 4) suggests 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 the birthing person's coping and labor progress, maximize oxygenation and uterine and umbilical cord blood flow, and support appropriate uterine activity. Consider the birthing person and their 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 birthing person and their family's values, desires for the birth experience, and cultural and personal preferences (AWHONN, 2022c). 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. Nurses should be attentive to their own body language, communication and listening skills, and care practices, since these are known to affect the birth experience (Atienza-Carrasco et al., 2018; 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 birthing person and their support persons (AWHONN, 2022c; Lyndon et al., 2017). The quality of clinician–patient interpersonal interactions and an emphasis on shared decision-making improves patients' feelings of safety and perceptions of the birth experience (Attanasio et al., 2014; AWHONN, 2022c; Lyndon et al., 2018).

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 et al., 2017). Nurses play a crucial role in creating a caring culture and prioritizing continuous labor support (AWHONN, 2022c). Continuous labor support that includes information, emotional and physical care, and advocacy helps the patient to feel protected and safe (Lunda et al., 2018), thus decreasing fear and stress hormones, which can interfere with labor progress (Green & Hotelling, 2019). Labor support by an experienced provider who is present solely for that purpose and is not part of the birthing person's network was shown to be beneficial (Bohren et al., 2017). Numerous advocacy efforts are underway to promote better access to midwifery care and doula support (March of Dimes, 2022; H. Smith et al., 2016/2022). In situations where dedicated care is unavailable, support from a designated family

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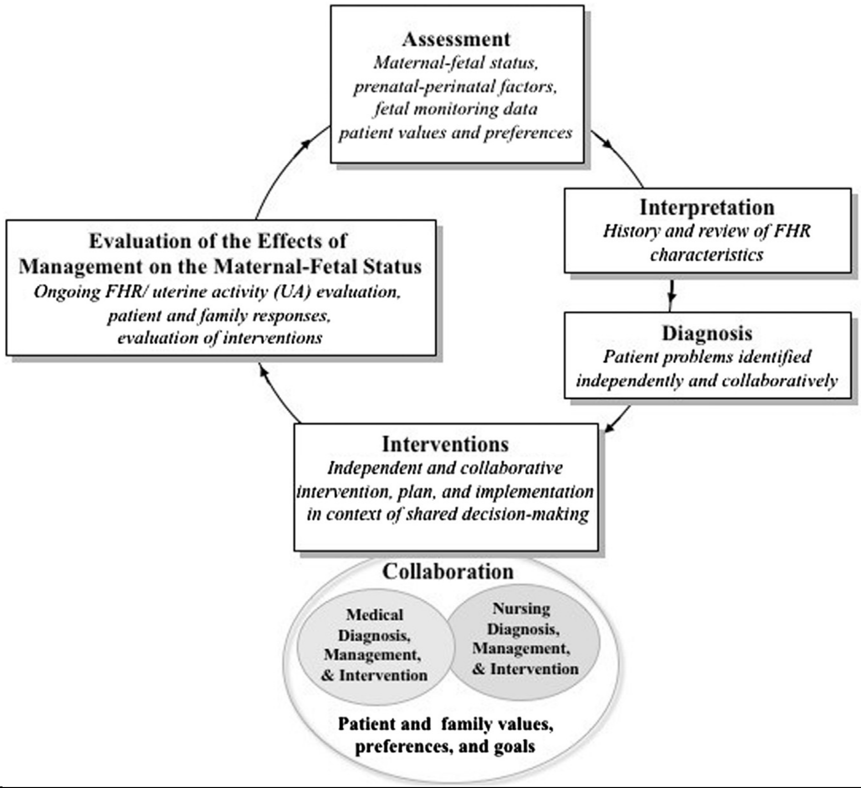
FIGURE 4 COLLABORATIVE PROCESS AND FETAL HEART MONITORING



Note. FHR = fetal heart rate. Copyright by the Association of Women's Health, Obstetric and Neonatal Nurses. Used with permission.

member or friend appears to improve a pregnant woman's satisfaction and overall birth experience (Bohren et al., 2017).

Interventions for Category II FHR Findings Using IA

Interventions may be needed to address 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 (Schifrin et al., 2022; Vintzileos & Smulian, 2016).

Since Category II auscultated findings include all findings not classified as Category I (normal), EFM should be initiated 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 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 prompt evaluation and possible medical treatment since fetal status may deteriorate over time (Cuneo, 2008), leading to severe morbidity or fetal death (Ghenbot et al., 2019).

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 et al., 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 and may result from a variety of causes (ACOG, 2010). Bradycardia in the range of 80 to 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.

TABLE 6 CAUSES OF CATEGORY II FHR CHARACTERISTICS

Baseline Changes

Tachycardia	Bradycardia
Birthing person 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	Birthing person 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
- Hypotension of the birthing person
- Excessive uterine activity
- Placental abruption
- Intrauterine growth restriction
- Conditions of the birthing person (hypertensive disorders, diabetes mellitus, asthma, pneumonia)

Prolonged decelerations

- Uterine tachysystole
- Acute hypotension of the birthing person
- Acute hypoxia of the birthing person (seizure, respiratory or cardiac arrest)
- Placental abruption
- Uterine rupture
- Cord compression or prolapse
- Ruptured vasa previa
- Profound fetal head compression
- Rapid fetal descent

Note. FHR = fetal heart rate. Sources: ACOG (2010/2021); Freeman et al. (2012); Lyndon and O'Brien-Abel (2021).

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Irregular Heart Rate Rhythm

While most fetal cardiac arrhythmias are transient and benign, persistent and clinically significant arrhythmias can cause severe morbidity and fetal demise (Yuan, 2020). Even when benign, the presence of an irregular rhythm when using IA constitutes a Category II FHR status (Lyndon & O'Brien-Abel, 2021); hence, 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 disease of the birthing person; intermittent or prolonged umbilical cord occlusion; or sudden or sustained interruptions in maternal, uterine, or fetal oxygenation (ACOG, 2010; Freeman et al., 2012; D. A. Miller, 2017). 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 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 and intervention. Since IA cannot identify deceleration types, evaluation with EFM is warranted to further investigate associated characteristics to appropriately guide intrauterine resuscitation techniques aimed at the suspected 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 the birthing person's pulse to distinguish the FHR baseline change from the birthing person's heart rate.

Intrauterine Resuscitation

The goals of intrauterine resuscitation are to support patient 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 (K. R. Simpson, 2021). When using IA for fetal surveillance, these interventions may include the following:

- Repositioning of the birthing person
- Reduction of uterine activity
- Intravenous (IV) fluid bolus
- Correction of hypotension of the birthing person
- Oxygen administration
- Physiologic pushing techniques or modification of pushing efforts

These interventions are thought to improve the birthing person's blood flow, placental perfusion, and fetal oxygenation. While research has demonstrated positive effects of certain uterine resuscitation techniques on fetal oxygenation, no data suggest that they can reverse fetal acidemia (K. R. Simpson, 2021; see Table 7).

Patient Positioning. Lateral positioning alleviates compression of the birthing person's vena cava and aorta and thus maximizes their cardiac output and return and improves uterine perfusion (Freeman

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 of 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 of labor) • If prolapse umbilical cord is noted, elevation of the presenting fetal part as preparations are underway 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. IV = intravenous. From "Physiologic Interventions for Fetal Heart Rate Patterns," by K. R. Simpson, in A. Lyndon & K. Wisner (Eds.), *Fetal Heart Monitoring Principles and Practices* (6th ed.), 2021, p. 160. Copyright 2021 by the Association Women's Health, Obstetric and Neonatal Nurses. Adapted with permission.

et al., 2012; Humphries et al., 2019). Lateral positioning or repositioning can also relieve umbilical cord compression by changing the relationship between the uterine wall, umbilical cord, and fetal parts (K. R. Simpson, 2021). Researchers have compared fetal oxygenation status in right lateral, left lateral, and supine positions of the birthing person. They found improved fetal oxygenation in the left lateral position (Aldrich et al., 1995; Carbonne et al., 1996) and in left and right lateral positions (K. R. 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 et al., 1986).

Reduction of Uterine Activity. Uterine contractions of sufficient intensity cause a collapse of the spiral arteries when pressure in the uterine muscle 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 outcomes for the birthing person and neonate, 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 (K. R. Simpson & James, 2008), and fetal acidemia defined as an umbilical artery pH of 7.11 or less at birth (Bakker et al., 2007).

Research suggests that even brief periods of excessive uterine activity affect fetal oxygenation (K. R. Simpson & James, 2008); hence, from the perspective of fetal safety, interventions for tachysystole should not be delayed until the FHR exhibits indeterminate characteristics (K. R. Simpson, 2020, 2021). 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 IV Fluids. The administration of IV fluids in labor is thought to improve placental perfusion by maintaining or correcting intravascular volume for the birthing person. Data on the efficacy of the administration of an IV fluid bolus as an intrauterine resuscitation technique are limited. The administration of a 500- to 1,000-ml bolus of Ringer's lactate solution was found to significantly increase fetal oxygenation, with the largest increases observed in patients receiving the 1,000-ml bolus (K. R. 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 fluid balance or hemodynamic stability in the birthing person. These include cardiac disease, preeclampsia, and the use of magnesium sulfate and other tocolytics (ACOG, 2019b; da Silva et al., 2021; Xiao et al., 2014). Pregnancy is a risk factor for pulmonary edema because of a decrease in colloid osmotic pressure in the birthing person and increases in cardiac output and plasma volume. The use of an isotonic solution is recommended instead of glucose-containing solutions since IV glucose may have adverse effects for the neonate and birthing person (K. R. Simpson, 2021).

Oxygen Administration During Labor. 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 L per minute (Haydon et al., 2006; K. R. Simpson & James, 2005). The greatest increases in fetal oxygenation occurred in fetuses with lower baseline fetal oxygen saturations (K. R. 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 (K. R. Simpson, 2008).

The routine use of oxygen to treat indeterminate or abnormal FHR characteristics has been questioned in cases without evidence of hypoxia in the birthing person (Hamel et al., 2014). ACOG recently advised against routine oxygen supplementation in response to Category II or III FHR patterns (ACOG, 2022). Based on a robust body of classic literature supporting its use, AWHONN (2022a) continues to recommend oxygen supplementation in certain situations. These recommendations are summarized in Box 3.

Alteration to Pushing Efforts in Second Stage. A thorough review of interventions to promote the well-being of the birthing person and fetus and avoid iatrogenic harm during the second stage of labor is presented elsewhere (AWHONN, 2018; K. R. Simpson, 2021). A summary of second-stage labor care to promote fetal well-being is presented in Box 4. When Category II FHR characteristics are detected, temporarily discontinuing pushing or reducing pushing efforts to every other or every third contraction may allow the fetus to recover and prevent further deterioration of fetal status (AWHONN, in press; K. R. Simpson, 2021).

Communication and IA

Communication regarding FHM during the intrapartum period includes the exchange of verbal, nonverbal, and written information among nurses, physicians, midwives, the laboring person, and their support persons. Effective patient-centered communication is a

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BOX 3 AWHONN RECOMMENDATIONS FOR OXYGEN ADMINISTRATION FOR CATEGORY II OR III FHR FINDINGS

- Oxygen should not be the first-line intervention for intrauterine resuscitation but, rather, used if other measures are not successful and then discontinued when the concerning FHR characteristics have resolved (Simpson, 2008).
- Based on the available evidence, maternal oxygen therapy as an intrauterine resuscitation technique for 15 to 30 minutes appears to be reasonable in selected cases, such as an FHR tracing with minimal or absent variability in the context of recurrent late, variable, or prolonged decelerations if other intrauterine resuscitation measures have not been successful. Discontinuation of oxygen is based on the fetal response as noted by the FHR pattern or changes in the plan of care, such as expeditious birth (O'Brien-Abel & Simpson, 2021).
- If the FHR tracing has moderate variability, fetal hypoxemia has generally been ruled out, so maternal oxygen administration is not indicated (Simpson, 2022).
- If there is concern for fetal well-being, simultaneous administration of oxygen and oxytocin does not make sense in the context of minimizing stress to the fetus (Simpson, 2020).

Note. AWHONN = Association of Women's Health, Obstetric and Neonatal Nurses; FHR = fetal heart rate; From "AWHONN Response to ACOG's Practice Advisory on Oxygen Supplementation in the Setting of Category II or III Fetal Heart Rate Tracings," by Association of Women's Health, Obstetric and Neonatal Nurses, 2022a.

BOX 4 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 10 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. FHR = Fetal heart rate. 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. Copyright 2018 by the Association of Women's Health, Obstetric and Neonatal Nurses. Reprinted with permission.

pivotal support to the quality and efficacy of multiple provider-, institutional-, and patient-level perinatal outcomes (Sakala et al., 2020; Spigel et al., 2022; Vedam et al., 2019a; White VanGompel, 2021). These outcomes include patient and provider satisfaction, perceptions of safety, and maternal and neonatal morbidity and mortality (Breman et al., 2022; Furr et al., 2021; Megregian et al., 2020; O'Brien et al., 2021; Poprzeczny, 2020; TJC, 2022b). At the same time, shared decision-making and increased respect for patient autonomy have been identified as effective measures to help address inequity and racism in perinatal care (Altman et al., 2019; Matthews et al., 2021; Scott et al., 2019; Zhuang et al., 2023).

Communication With the Patient and Support Persons

Despite the emphasis on patient-centered approaches including shared decision-making in perinatal care (ACNM, 2022b), patients and providers report barriers to its implementation (Begley et al., 2021; Declerq et al., 2018). Birthing people should be provided with adequate education regarding FHM options and encouraged to participate in the ongoing decision-making process regarding monitoring method during labor. This can involve a collaborative process of exploring choices, clarifying options, and assisting in the shared decision-making process (Cypher, 2019; K. R. Simpson, 2019). Choices and options should be presented without jargon and include information about the associated risks and benefits, indications, and limitations of each method (ACNM, 2015). Discussions about the birthing person's preferences regarding FHM and disclosure about typical institution- or provider-specific interventions such as IV fluids, diet restrictions, and 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 birthing persons and their families to be full partners in the decision-making process (ACOG, 2019a).

Effective and sensitive communication with the birthing person and their 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 birthing person's primary language is not English (Origlia Ikhilor et al., 2019; TJC, 2014). When inquiring about sensitive or private information, providers should ask the birthing person who they would like to have present during the discussion and ensure privacy to avoid confidentiality breaches.

When preparing to auscultate the FHR, the nurse should explain to the birthing person and their support persons how the equipment works, what sounds are heard, and what the findings mean in lay terms. After asking for the patient's permission to proceed, the nurse should discuss what might happen if indeterminate FHR characteristics are detected so that the birthing person and support persons are prepared if intrauterine resuscitation techniques are initiated quickly.

Effective Clinician Communication

Root cause analyses of sentinel events have identified communication issues as a leading contributor to adverse outcomes (TJC, 2022b). All major obstetric professional organizations in the United States emphasize the importance of using standardized nomenclature for the communication of FHM information to ensure effective communication of clinical information and to decrease error (ACNM, 2018; ACOG, 2009; AWHONN, in press). The standardized nomenclature defined in the National Institute of Child Health and Human Development workshop report (Macones et al., 2008) is recommended for use in practice by AWHONN (in press), ACNM (2018), 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, 2021; see Box 2).

Communication between providers should be clear, direct, and patient-centered. Essential elements of FHM information include labor progress and stage of labor, coping of the birthing person, relevant medical and obstetric history and results of diagnostic or laboratory tests, vital signs, FHR and uterine activity, the evolution of FHR changes over time, changes in maternal–fetal status, and interventions implemented and subsequent responses. Individual nurses can proactively contribute to effective communication and collaboration by assuming positive intentions, engaging in humility, understanding the validity of others' viewpoints, and keeping the patient's safety and best interests at the center of all activity and interactions (Lyndon et al., 2015). When requesting a provider evaluation, concise and effective communication should include a clear statement of the problem; relevant history and background; and the nurse's analysis of the situation, including a consideration of available options and a clearly stated recommendation and request (Institute for Healthcare Improvement, 2022; Lyndon & Zlatnik, 2021).

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 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.). Recent reviews of the literature have confirmed the effectiveness of tools for shared decision-making between providers and patients in perinatal care, especially in reducing decisional conflict and regret and improving patient knowledge (Megregian et al., 2020; Poprzeczny et al., 2020). The use of SBAR (situation, background, assessment, recommendation) and SBAR-R-R (situation, background, assessment, recommendation, reasoning, ratification) is recommended by AWHONN (Lyndon & Zlatnik, 2021) 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 members of the health care team, a process of collaborative resolution should be sought, including use of the chain of resolution if necessary. If the disagreement does not occur during an emergency, health care team members 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 birthing person and their family can be especially challenging to manage and resolve. Divergent perspectives on what constitutes best practices, 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 remember that communication is a skill set and that members of the health care team share a common goal to provide safe and effective care of the birthing person and their fetus or fetuses (Ansari et al., 2020; Lyndon et al., 2014; K. R. Simpson et al., 2006).

Educational Issues

Proficiency in the IA method requires cognitive knowledge, psychomotor skills, critical thinking, effective communication, and competent decision-making. The use of IA has become a somewhat lost art because most nurses, midwives, and physicians 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 FHM approaches including IA, AWHONN 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, in press; Lyndon & Zlatnik, 2021).

Education alone may not be sufficient to support the appropriate use and enculturation of IA into practice. Factors such as organizational or unit culture, lack of administrative support, lack of a clear protocol for use of IA, the expectations of others, staffing and acuity issues, patient care and documentation demands, limited resources, and liability concerns may influence nurses' intention and ability to use IA (Blix et al., 2019; Chuey et al., 2020; Hersh et al., 2014; Housseine et al., 2019, 2020; Kinikanwo et al., 2022; Patey et al., 2017; Romano & Buxton, 2020). Multiple strategies should be employed to provide and communicate an organization's structural

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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, and the name of the woman you are calling about and 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. Ensure 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. EFM = electronic fetal monitoring; FHR = fetal heart rate; GPTAL = gravidity, term, preterm, abortion, living; IA = intermittent auscultation; OB = obstetric; SBAR-R-R = situation, background, assessment, recommendation, reasoning, ratification. From "Communication of Fetal Heart Monitoring Information," by A. Lyndon and M. G. Zlatnik, 2021, in A. Lyndon & K. Wisner (Eds.), *Fetal Heart Monitoring Principles and Practices* (6th ed.), 2021, p. 218. Copyright 2021 by the Association of Women's Health, Obstetric and Neonatal Nurses.

BOX 5 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 command
- Discussion of strategies for the implementation of IA as the default FHM method for low-risk birthing people

Note. FHR = fetal heart rate; IA = intermittent auscultation.

and cultural support for IA (H. 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 in low-risk pregnancies, and robust clinician and patient education programs surrounding IA (H. Smith et al., 2016).

Curriculum

Specific content to be included in FHM education programs is summarized in Box 5. Modalities for ongoing skills assessment or competency validation may include a variety of approaches such as case reviews, classroom activities, online trainings, simulation and drills, review of research literature or clinical improvement projects, and hands-on skills review. An interdisciplinary approach to learning ensures all members of the health care team 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 FHM Program. The AWHONN FHM program includes introductory, intermediate, and advanced content as well as an instructor course and an online course specific to simulation training for IA (AWHONN, 2022b). 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 (2023) offers certification in EFM for licensed registered nurses, nurse practitioners, midwives, paramedics, and physicians or physician assistants in the United States and Canada. While this certification examination emphasizes EFM, some content is included on IA. Inteleos (2024) offers a fetal monitoring credential (FMC) formerly offered by the Perinatal Quality Foundation, which does not contain content on IA. The Institute for Perinatal Quality Improvement (2021) also provides an IA simulation-based training and a discount for AWHONN members.

Ongoing Proficiency in FHM

A number of online FHM assessment proficiency programs are available that are geared toward interpretation and management of EFM tracings (AWHONN, 2022b; GE Healthcare, 2022; NurseEd, 2022; Relias Academy, 2022). 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 nurses 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 birthing people and fetuses, including for when IA is the primary method of fetal surveillance.

Who Should Perform IA

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, in press). It is inappropriate to delegate any assessments or interventions that require professional knowledge, judgment, or skill to unlicensed/unregulated assistive personnel caring for birthing people (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 2022, AWHONN released the updated *Standards for Professional Registered Nurse Staffing for Perinatal Units*, which address several decades' worth of research evidence suggesting that inadequate staffing negatively affects patient care and, conversely, that adequate staffing is essential for the well-being of patients and nurses (AWHONN, 2022d; K. R. Simpson, 2022). The AWHONN (2022d) *Standards 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. In fact, these guidelines specify a nurse–patient ratio of 1:1 in all intrapartum situations and with all FHM modalities, except for a suggested ratio of 1:2 for uncomplicated labor when using EFM (AWHONN, 2022d). Therefore, it is recommended that a 1:1 nurse–patient ratio

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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 birthing person 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 birthing people 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, 2022d). It may be a challenge to incorporate IA in settings where patients outnumber providers (ACNM, 2015; Arnold & Gawrys, 2020). The COVID-19 pandemic has further exacerbated the pressures on labor and delivery staffing (George et al., 2021). In a secondary analysis of the responses from the AWHONN 2010 nurse staffing survey, K. R. Simpson and colleagues (2016) found that nurses felt inadequate staffing on perinatal units may result in job dissatisfaction, missed care, and failure to rescue. However, institutional adherence to AWHONN staffing standards has been shown to decrease the perceived frequency of being "swamped" (Roth et al., 2020). A 2019 study reported that most labor nurses surveyed perceived hospitals to comply with AWHONN staffing standards, reinforcing the role professional standards can play in supporting effective nursing care (K. R. Simpson et al., 2019). Use of data from the electronic medical record to align nurse staffing data with patient needs has been suggested as a strategy for meeting AWHONN nurse staffing standards (Jones & Hall, 2022). In addition, nursing care quality indicators such as exclusive breast milk feeding have recently been used to evaluate the impact of missed nursing care when benchmarks for these quality indicators are not met (Lyndon et el., 2022; K. R. Simpson et al., 2020), suggesting that the use of IA might also be helpful as an indicator of adequate nursing care and staffing.

A follow-up survey of hospitals after the implementation of the previous AWHONN staffing recommendations published in 2010 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 patients receiving oxytocin in labor (Scheich & Bingham, 2015). It may be useful to consider the benefits of IA when integrated into the care plan for birthing people 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 et al., 2021). According to the evidence-based practice guideline *Labor Support for Vaginal Birth* (AWHONN, 2022c), inadequate staffing can be a barrier to the provision of effective labor support. The recommendations identify adequate staffing as essential to the provision of continuous labor support assessment of the birthing person and fetus in accordance with national guidelines. 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 (AWHONN, 2022c; K. R. Simpson, 2009, 2012, 2015), care that optimizes outcomes and minimizes the need for intervention for birthing people 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 (AWHONN, 2022c; Lyndon et al., 2017; K. R. Simpson, 2017).

Legal Issues

Perinatal care in the United States carries a relatively high risk of litigation, and this fact should be acknowledged and comprehensively addressed (L. A. Miller, 2018; Sakala et al., 2013). Physicians and midwives and, by extension the entire obstetric team, may become the target of a lawsuit when there is an adverse neonatal outcome (Ghaith et al., 2022). 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 et al., 2005). Obstetrics and gynecology malpractice claims result in the highest paid-claim rates and the highest proportion of claims over $1 million (Glover et al., 2020), with the highest claims exceeding $200 million (Snyder, 2020). One analysis of closed claims by nursing specialty found that obstetrics represented the highest average total liability claims incurred among all nursing specialties (CNA & Nurses Service Organization, 2020). EFM is one of the most common issues cited in obstetric malpractice claims (Santos et al., 2019). 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 (Betrán et al., 2018; Sartwelle & Johnston, 2015). However, a recent systematic review found little to no relationship between malpractice liability risk and health care outcomes and quality (Mello et al., 2020). 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 (McRae, 1999). In addition, being involved in a malpractice suit can cause significant trauma to nurses and other health care providers (Chan et al., 2017).

As discussed previously, recent practice recommendations align with patients' reported preferences to support increased availability of IA for fetal surveillance (ACNM, 2015; ACOG, 2019; Alfirevic et al., 2017; Blix et al., 2019; Cox & King, 2015; TJC, 2022a; H. Smith et al., 2016/2022). According to L. A. Miller (2015), there are three focus areas of risk management in use of IA: "(1) informed consent of the labouring 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 birthing person 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 (L. A. Miller, 2015; O'Neill et al., 2020). 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 frequency with which EFM is used. However, measures taken to minimize malpractice litigation exposure with EFM could also apply in the use of IA. K. R. 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 ensure 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 L. A. Miller's (2015) analysis and the current practice recommendations (ACNM, 2015, 2022a; ACOG, 2019a; TJC, 2022a; H. 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, practice bundling and documentation (Blix et al., 2019; Gams et al., 2019; Graham et al., 2014; Heelan, 2013; Hersh et al., 2014; Javernick et al., 2021; Jepsen et al., 2022; Lundsberg et al., 2020; Romano & Buxton, 2020; H. Smith, 2017; Snelgrove-Clarke & Scott-Findlay, 2005). These strategies should include engaging birthing people as essential partners in shared decision-making for safe, evidence-based practice (K. R. Simpson, 2019; H. Smith et al., 2016). Several useful resources are available to support the process of incorporating IA. Romano and Buxton (2020) designed a quality improvement program aimed at improving IA skills. Javernick et al. (2021) created a low-intervention approach to perinatal care that emphasizes IA education and practice. Maude and colleagues (2014) developed a decision-making framework called intelligent structured IA, which has been shown to successfully assist with translation of the evidence-based IA into practice by midwives caring for birthing people with low-risk pregnancies. As part of the Toolkit to Support Vaginal Birth and the Prevention of Primary Cesareans (H. Smith et al., 2016), the California Maternal Quality Care Collaborative included comprehensive recommendations for the implementation of IA and intermittent fetal monitoring (see Box 6).

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
- Context of the transfer site and, in particular, the influence of individuals, project teams, and social networks
- Availability of a dedicated facilitator or opinion leader

BOX 6 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 et al., 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 the 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, 2022d).
- 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, is readily available in sufficient numbers.
- Develop a competency tool for evaluating knowledge of procedures and use of equipment.

Note. AWHONN = Association of Women's Health, Obstetric and Neonatal Nurses; EFM = electronic fetal monitoring; FHR = fetal heart rate; IA = intermittent auscultation. From *Toolkit to Support Vaginal Birth and Reduce Primary Cesareans: A Quality Improvement Toolkit*, by H. Smith, N. Peterson, D. Lagrew, and E. Main, 2016, California Maternal Quality Care Collaborative, p. 48. Copyright 2016 by California Maternal Quality Care Collaborative. Reprinted with permission.

Important first steps for increased implementation of IA include discussion of institution-specific enablers and barriers. In addition to the recommendations in Box 6 (H. 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. Multiple researchers have explored why IA is not used more often

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during low-risk labors given the evidence (Greene, 2006; Lundsberg et al., 2020; Maude et al., 2014; Parer, 2003; Sakala et al., 2020; K. R. Simpson, 2005; Wood, 2003). Better understanding of the complex barriers to and facilitators of IA use are needed to fully incorporate it in perinatal care. Ongoing and unresolved research topics regarding IA use include further evidence regarding IA technique and best practices; patient knowledge and preferences; additional outcomes that may be associated with IA, including the effect on the rate of primary cesarean births; the relationship, if any, between IA use and continuous labor support, including its associated benefits; the role of IA as an indicator of quality nursing care; and the best model for staff education and implementation of an evidence-based IA practice (see Appendix B).

Summary

IA is an evidence-based method of fetal surveillance during labor that is part of an integrated approach to support optimal outcomes for birthing people. 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. Birthing people 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 birthing people, their fetus(es), and childbearing families.

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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
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

(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)
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
Outcomes	EFM group Increased CS rate Improved pH, pO2, pCO2 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.

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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?
	What is the best technology to use when performing IA?
Maternal Knowledge and Preferences	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?
	How can we incorporate information on IA into the prenatal education our patients receive?
Labor Support	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?