

## [Putting intelligent structured intermittent auscultation \(ISIA\) into practice](#)

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### Abstract

*Background:* Fetal monitoring guidelines recommend intermittent auscultation for the monitoring of fetal wellbeing during labour for low-risk women. However, these guidelines are not being translated into practice and low-risk women birthing in institutional maternity units are increasingly exposed to continuous cardiotocographic monitoring, both on admission to hospital and during labour. When continuous fetal monitoring becomes routinised, midwives and obstetricians lose practical skills around intermittent auscultation. To support clinical practice and decision-making around auscultation modality, the intelligent structured intermittent auscultation (ISIA) framework was developed.

*Aim:* The purpose of this discussion paper is to describe the application of intelligent structured intermittent auscultation in practice.

*Discussion:* The intelligent structured intermittent auscultation decision-making framework is a knowledge translation tool that supports the implementation of evidence into practice around the use of intermittent auscultation for fetal heart monitoring for low-risk women during labour. An understanding of the physiology of the materno-utero-placental unit and control of the fetal heart underpin the development of the framework.

*Conclusion:* Intelligent structured intermittent auscultation provides midwives with a robust means of demonstrating their critical thinking and clinical reasoning and supports their understanding of normal physiological birth.

**Key Words** Fetal Monitoring; Intermittent Auscultation; Midwifery; Decision-making; Knowledge Dissemination Tool

## 1. Introduction

**Problem or Issue:** Fetal monitoring guidelines recommend intermittent auscultation for fetal heart rate monitoring for low risk women. However, this advice is not being translated into practice and the unnecessary application of cardiotocography (CTG) continues to dominate many institutional maternity units.

**What is Already Known:** For low risk women, CTG monitoring is associated with an increased risk for caesarean section without improved outcomes for babies.

**What this Paper Adds:** This paper describes the ISIA decision-making framework for the implementation of evidence into practice around fetal heart monitoring for low-risk women. The ISIA framework re-establishes the validity of intermittent auscultation as a fundamental midwifery skill in the guardianship of normal birth

Intermittent auscultation (IA) of the fetal heart rate (FHR) is a screening tool for the assessment of fetal well-being during labour. The detection of changes in the fetal heart rate and rhythm may signal fetal compromise requiring immediate action. The clinical practice of IA is a fundamental midwifery skill. IA requires the midwife to remain close by the woman throughout labour and to be in physical contact in order to monitor the baby. Evidence-informed fetal monitoring guidelines recommend intermittent auscultation for fetal heart rate monitoring for women with uncomplicated pregnancies, also known as low risk women [1-5]. However, this advice is not being translated into practice and the unnecessary application of cardiotocography (CTG) continues to dominate many institutional maternity units [6]. As a

consequence, midwives and obstetricians are increasingly less familiar with decision-making and the skills required to use intermittent auscultation in practice [7].

Studies comparing intermittent auscultation and monitoring with the CTG machine, for low risk women, found an increase in the incidence of caesarean section without evidence of benefit for mothers and babies. For low risk women the use of admission CTG, is associated with an increase in the caesarean section rate by 20% [8, 9]. There is a dearth of practice descriptions for the conduct of intermittent auscultation. Current protocols for IA (frequency, timing and duration) are based on expert opinion rather than scientific evidence. An understanding of the physiology underpinning fetal heart monitoring is important for all intrapartum care providers. To disseminate knowledge of the safety and efficacy of IA, we have identified a need for a consistent and robust knowledge tool to assist decision-making, practice, and interpretation of IA. It was in this context that a new decision-making framework for fetal heart rate monitoring was developed. The framework is called Intelligent Structured Intermittent Auscultation (ISIA) [10, 11]. ISIA was tested in a mixed methods pre- and post- intervention study in one New Zealand maternity unit, the findings of which are reported elsewhere [10].

The ISIA informed decision-making framework supported midwives to make changes to their personal practice and to the culture of the organisation where they practice. Midwives felt that returning to or engaging with an essential midwifery skill, such as intermittent auscultation, gave them 'voice' and new strength to be guardians of normal birth, and provided a tool to inform communication between maternity care providers with differing world views. Other changes to practice have been described in the previous publication where ISIA was first introduced [11], but a more detailed description of the elements that make up the framework is required. The purpose of this paper is to provide a greater depth of understanding about ISIA and its application in practice.

## 2. Development of Intelligent Structured Intermittent Auscultation (ISIA)

During 2007 there were discussions, prompted by us, around the use of IA for fetal heart monitoring for low-risk women with two very active international discussion groups: <https://www.Midwifery-Research@jiscmail.ac.uk> and <https://www.Normalbirth-Research@Jiscmail.ac.uk>. Over this period there were 55 postings on the email list from 31 midwives from New Zealand, Australia, UK, USA, and Europe. We analysed the postings and six common themes emerged: evidence/guidelines, staffing levels impacting on midwives' ability to perform IA, CTG monitoring used as a defensive practice, the use of fetal movements with IA, questioning the accuracy/variability of IA, and using normal physiology as the starting point for understanding and interpreting IA. The most useful and insightful discussions were those related to starting from a premise of normal physiology, and incorporating fetal movements into the IA process. The development of a detailed IA framework that would provide midwives with clear direction on how to conduct IA was promulgated. The ISIA decision-making framework for fetal heart monitoring for low risk women emerged as a result of these discussions.

ISIA is underpinned by knowledge of the underlying physiology associated with the materno–utero–placental unit, the control of the FHR and fetal responses to hypoxia. Evidence from first generation knowledge (primary studies), second generation knowledge (systematic reviews) from studies comparing IA with electronic fetal monitoring (EFM), and IA compared with Admission CTG was incorporated. An examination of third generation knowledge (guidelines) [12, 13]; revealed insufficient detail existed to appropriately support how midwives conducted and interpreted IA in practice. Two concepts have been incorporated into the ISIA framework : recording fetal movements and the determination of fetal heart rate increases associated with fetal movements. The language of ISIA is deliberately different to the language associated with CTG monitoring. This is because intermittent auscultation is a listening and counting method using basic equipment, such as the Pinard fetoscope, as opposed to the electronic form of FHR monitoring which has

developed its own language for interpretation. Applying the language of CTG to the interpretation of IA findings is counterproductive.

IA may be conducted with a fetal stethoscope (fetoscope) or a hand-held ultrasound device. Non-electronic auscultation, such as the application of a Pinard fetoscope to the maternal abdomen (see Figure 2) for periods of up to one minute or more, allows practitioners to hear the sounds associated with the opening and closing of the ventricular valves in the fetal heart, via bone conduction, with each fetal cardiac cycle. With this type of device, the midwife can hear the actual fetal heart sounds, including any abnormal heart beat rhythms. Electronic devices such as the hand held Doppler device applied to the maternal abdomen use ultrasound technology to listen to the reflected and amplified sounds of the motion within the fetal heart, such as the moving heart walls or valves [12]. The information received by the Doppler device is converted into a sound that is heard and displayed as a representation of the fetal cardiac cycle [13].

There has been limited research into the devices used for intermittent auscultation. A small randomised controlled trial (1255 high risk women) conducted in Harare in less than optimal conditions compared the effectiveness of four different methods of intrapartum fetal heart rate monitoring [14]. These methods were intermittent electronic monitoring, Doppler ultrasound, use of Pinard stethoscope by a research midwife, or routine use of Pinard stethoscope by attending midwife, during the last 10 minutes of every half hour. The results revealed that fetal heart monitoring with a Doppler device was better than the Pinard stethoscope in detecting abnormalities in fetal heart rate. Notwithstanding the obvious limitations with the trial this finding has been incorporated into fetal monitoring guidelines. The ISIA framework does not state a preference for the type of device (Pinard or Doppler) to be used for fetal heart monitoring. This is an informed decision made between the woman and midwife that is cognisant of the context and the need to minimise any unnecessary disruptions to the normal flow of labour and the woman's concentration.

### 3. Implementation of Intelligent Structured Intermittent Auscultation (ISIA)

The aim of the ISIA framework is to guide women and maternity care providers in their decision making regarding monitoring choice, clinical practice, interpretation, and action on the use of IA of the fetal heart during labour for low-risk women. The ISIA framework is presented in two parts: the first providing decision-making tools for assessment at first contact in labour and the second for the conduct of on-going fetal heart monitoring during labour. The “Admission Assessment or First Contact in Labour” component (illustrated in Figure 1) is to be used by the maternity care provider when a woman is first admitted to an institutional birth setting or when first seen during labour, which may be in her home. The second part, “Ongoing IA in Active Labour” (illustrated in Figure 3), is to be used when the findings of the assessment phase indicate the woman is suitable for IA during active labour. We review these two components below.

#### 3.1 Admission Assessment or First Contact in Labour

In the antenatal period the maternity care provider monitors the woman throughout her pregnancy and screens for risk factors that have potential to impact on the well-being of the woman and/or baby. At first contact during labour further risk assessment continues. An absence of risk factors or any significant findings from either of these assessments means the woman is suitable to receive IA in labour. Since it is upon admission or first contact in labour that decisions about intermittent auscultation versus continuous monitoring are made, the ISIA admission assessment provides a clear algorithmic approach to decision-making linked with assessment. Each part of the admission assessment component is further discussed in the following pages.

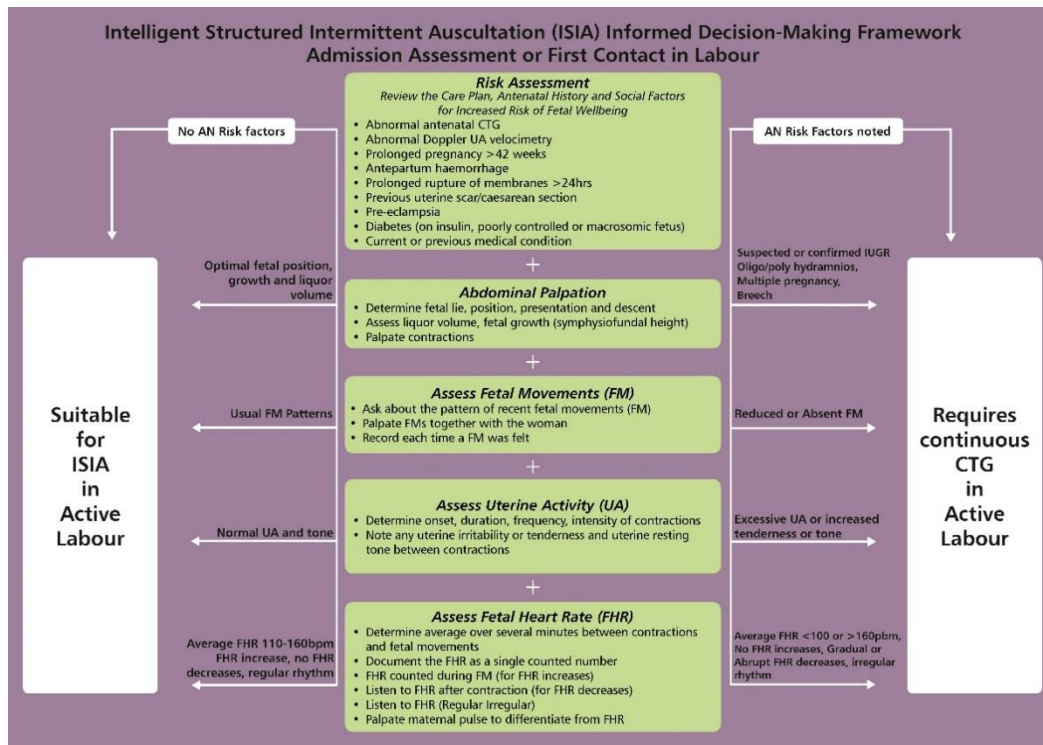


Figure 1: ISIA Admission Assessment or First Contact in Labour component

### 3.1.1 Risk Assessment

It is at the admission assessment that some midwives and obstetricians believe an admission CTG is justified. Many practitioners still recommend and apply this technology despite current evidence stating that admission CTG is not beneficial in low risk pregnancies and that the predictive value is poor and [8, 15, 16]. Our research suggests that admission assessment using the ISIA framework can be regarded as equivalent to an admission CTG trace in low risk women [17], and should be considered rather than the application of the CTG. The ISIA framework provides an alternative means of assessing fetal well-being at first contact in labour, supporting the clinical decision-making of the maternity provider in any model of care or maternity setting.

During labour, there are two key decision points where the maternity care provider and woman discuss and decide on a method of fetal heart rate monitoring (an initial evidence-informed discussion should take place in the antenatal period). The first decision point is at the time of the birth room admission assessment or during the first contact in labour. The midwife and woman discuss how she is coping with the labour, what supports

are needed moving forward, and review of the maternity care plan, as well as information gleaned from a physical assessment of the woman and her unborn baby [18, 19]. The second decision point in the assessment phase occurs after the risk status is determined, with a discussion and decision-making around ongoing FHR monitoring options [19]. The collective findings from the assessment are discussed with the woman and a decision about FHR monitoring modality can be made and documented on the care plan. In the absence of any risk factors and when all other parameters are normal, it is appropriate to offer and recommend intermittent auscultation for ongoing FHR monitoring during labour, and a statement to this effect is entered in the woman's medical record.

Risk assessment begins by reviewing the woman's care plan, antenatal history and any social factors that might increase risk to fetal wellbeing. The woman's previous obstetric, family, and medical histories are reviewed and summarised taking into account any factors considered to place the fetus at higher risk during labour such as those included in all fetal heart monitoring guidelines [1-5] and our previous publication [11]. It is also important to consider any social risk factors, such as smoking [20, 21] that may contribute to an increased risk to fetal well-being.

The following explanations relate to the information gathered through physical assessment and listening to the FHR.

### *3.1.2 Abdominal Palpation (AP)*

The ISIA framework draws on the basic skills of auscultation and palpation as the means by which the midwife gains information about the well-being of the woman and her baby. The essential midwifery skills of touching, feeling, sensing, hearing, seeing, and knowing are employed [10]. Abdominal palpation determines fetal lie, presentation, position, descent of the presenting part and provides the ability to feel fetal movements [6]. Identification of the fetal position enables the midwife to position the IA device in the best place on the maternal abdomen to hear the fetal heart [12, 13, 22]. Measurement of the symphysis-fundal height along with clinical assessment of fetal growth and liquor volume will



reveal that the fetus is well grown and likely to be healthy [23]. Uterine activity is also palpated during abdominal palpation.

### *3.1.3 Assess Uterine Activity (UA)*

Uterine palpation by gentle touch throughout a series of contractions will determine the frequency, duration, and strength of contractions [12, 13, 24]. The presence of any uterine irritability or tenderness and the uterine resting tone between contractions are also determined at this time. Palpation of contractions enable the midwife to accurately time when to listen to the FHR. Contractions are quantified as the number of contractions present in a 10-minute period, averaged over 30 minutes, and recorded as (for example) 3:10 (3 contractions in 10 minutes).

### *3.1.4 Assess Fetal Movements (FM)*

Fetal movements during pregnancy indicate fetal well-being because they are evidence of the integrity of both the central nervous system and the musculo-skeletal system of the fetus. Contrary to the understanding of some women and maternity care providers, the frequency of fetal movements does not diminish in the late third trimester [25]. There is great variation between pregnant women in terms of the numbers of fetal movements perceived, making pre-set numerical movement limits difficult to apply in screening tools [26]. Therefore, a woman's perception of her baby's usual intrauterine movement patterns leading up to labour is more likely to be relevant. This makes the woman the key purveyor of knowledge about herself and her baby.

The inclusion of fetal movements as an indicator of fetal well-being in the ISIA framework is one way in which ISIA differs from other IA practice descriptions. The presence of fetal breathing movements and fetal body movements "*indicate that the normal fetus continues with its "routine" activities during labour. These fetal activities may prove helpful in the intrapartum assessment of fetal well-being*" [27, p. 321]. Determining the fetal movement patterns at the first contact during labour is achieved by asking the woman about the pattern of recent FMs and then recording the last time a FM was felt. Listening to the fetal heart

during a fetal movement is also the best time to determine increases of the FHR above the pre-determined average FHR (referred to in the literature as auscultated accelerations [28-34]).

### *3.1.5 Assess Fetal Heart Rate (FHR)*

Auscultation of the fetal heart will enable the average rate and rhythm to be determined, along with the presence of fetal heart rate increases and the absence of fetal heart rate decreases. During auscultation of the fetal heart it is easy to hear other sounds, such as blood flow through the umbilical cord or the placenta, making it important to differentiate the maternal and fetal heart rates. This is done by simultaneously palpating the maternal radial pulse during auscultation [12, 13] (see Figure 2). According to Goodwin (2000) [13]:

*Auscultation requires extremely focused listening and counting of each fetal heart beat as it is heard. Using the index finger to tap the beat being heard may increase accuracy of auscultation findings when the rate is rapid. The tapped beat may be counted by a second observer so that the person auscultating can be fully focused on hearing the rapid heart sounds. (p.55)*



**Figure 2. Auscultation of the Fetal Heart Sounds with a Pinard stethoscope.**

Knowledge of the underlying physiology associated with the materno–utero–placental unit, the control of the FHR and fetal responses to hypoxia are important for all intrapartum care providers. The FHR responds to intrinsic, or internal, fetal factors (the electrical conduction system of the heart, the autonomic nervous system, and hormonal influences), extrinsic, or external, factors (placental influences, umbilical cord circulation, and maternal issues), and physiological factors [12, 35]. Fetal heart rate and rhythm, fetal heart rate increases and decreases, normal and abnormal fetal heart rates are described below.

The *average fetal heart rate* is determined by counting the fetal heart beats for periods of 60 seconds, between contractions and fetal movements, over a period of 10 minutes to obtain an average rate. A watch with a second hand or the stopwatch function on a mobile phone can be used to count the FHR for the recommended period [22]. The average FHR is expressed as a single number in beats per minute (bpm), that is, 130 bpm [2], the same as recording of the maternal pulse rate, and **not** as a range of numbers.

*Fetal heart rhythm* is not well defined in the literature nor is its significance known, however, it is possible to hear when the fetal heart beats are regular or irregular (not to be confused with FHR variability). If the fetal heart rhythm is irregular, further assessment is required. Irregular fetal heart beats may be associated with heart block. They are often benign and require no intervention and usually revert to a normal rhythm after the birth [12, 13].

*A fetal heart rate increase* is when the counted FHR is at least 15 bpm above the average FHR previously determined [23] and may be heard with or without a fetal movement. A FHR increase is considered a good sign of fetal health; that is, the fetus is responding to stimuli and displaying integrity of its mechanisms controlling the heart. Most FHR increases coincide with fetal movements, however FHR increases occurring repeatedly after contractions may not be associated with fetal movements and require closer monitoring over at least three contractions to rule out abnormalities [5].

*An abrupt or gradual decrease in the fetal heart rate* may be detected by listening to the FHR immediately after the end of a contraction and is considered an abnormal finding. The complete clinical situation of the woman and fetus should be reviewed in the presence of a FHR decrease after a contraction and measures taken to detect and correct any causes [10]. These measures are discussed in the section on going fetal heart monitoring with ISIA.

*Normal fetal heart rate findings* are when the average FHR is between 110 bpm and 160 bpm, the rhythm is regular, there are FHR increases above the previously determined average FHR with or without movements, and there is an absence of FHR decreases.

*Abnormal fetal heart rate findings* are when the average FHR is greater than 160 bpm (tachycardia) or less than 110 bpm (bradycardia), the rhythm is irregular, and/or there are abrupt or gradual decreases of the FHR.

### *3.1.6 Documentation of Admission Assessment*

Accurate documentation of all assessments made during the admission assessment provides evidence of clinical decision-making. When all of the elements of assessment have been shown to be within the normal parameters, the midwife is instructed to make a clear

statement that the woman is a suitable candidate for intermittent auscultation for ongoing FHR monitoring. An example of appropriate documentation is provided in Table 1.

**Table 1: Sample documentation when using the ISIA informed decision-making framework for admission assessment**

|  |  |  |
|--|--|--|
| <p><b>Date and time</b><br/>G2 P1;<br/>EDC<br/>25/9/11</p> | <p>Well woman with an uncomplicated pregnancy admitted at term in spontaneous labour since 0200hrs today, membranes intact. Antenatal history reviewed for risk factors – none found. Non-smoker. Good family support. Care plan indicates a preference for intermittent auscultation of the fetal heart rate during labour.</p> <p><u>On Examination:</u> Temperature 36.5, Pulse 78bpm, Respiration rate 20, BP 116/70, urinalysis NAD. (<i>Name of woman</i>) reports regular fetal movements have been felt and the pattern of fetal movements are unchanged over the past few weeks. The last fetal movement was felt 5 minutes ago.</p> <p><u>Abdominal palpation:</u> Fundus at term and liquor volume is clinically adequate. Longitudinal lie, cephalic presentation, left occipito-anterior position, head 2/5 palpable abdominally.</p> <p><u>Uterine activity:</u> contractions are coming every 3 minutes and lasting 50 seconds, they palpate as strong and the uterus is soft between contractions</p> <p><u>Fetal Heart Rate:</u> average FHR is 130 bpm, determined over 10 minutes. The FHR counted during a fetal movement is 148 bpm and there were no decreases in the FHR when counted after the end of the contraction for 60 seconds. FH Rhythm is</p> |  |
|--|--|--|

|  |  |   |
|--|--|---|
|  | <p>regular.</p> <p>All findings are within normal parameters and this woman is suitable for IA as on-going FR monitoring during active labour.</p> | <p><b>Signature and designation</b></p> |
|--|--|---|

### 3.1.7 Challenges associated with the use of ISIA

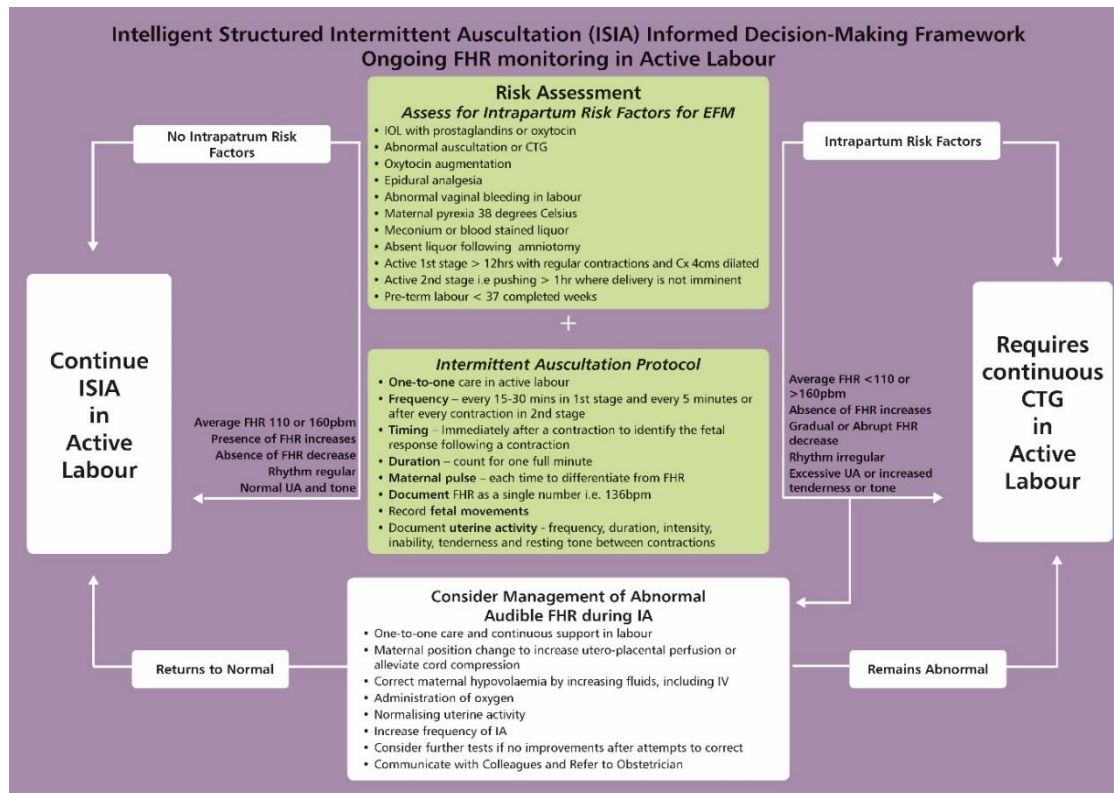
It is acknowledged that initiating ISIA at first contact in labour when the woman is in advanced labour and birth seems imminent can be challenging. Continuity of care ensures that the midwife has a thorough knowledge of the woman’s history and pregnancy progress to support a decision around choice of fetal monitoring in these circumstances. However, even when the midwife has no knowledge of the woman’s pregnancy and has not met her before, ISIA is still an effective assessment tool. The key priority is to provide immediate clinical care. The midwife can take a quick verbal history including screening for any risk factors. This can be obtained from the woman or her birth partner/support people.

In the absence of risk factors, initial auscultation of the fetal heart for one minute following a contraction, along with simultaneously palpating the maternal pulse to differentiate between the two, can be done over several contractions to determine the average fetal heart rate. Use of a hand-held Doppler device, if available, ensures that the woman can remain upright and active. If the fetal heart rate is in the normal range, ISIA continues as described below. The application of the CTG monitoring for a woman in advanced labour on admission, and in the absence of any known risk factors, may be counterproductive. Not only does it require the woman to be immobile to obtain accurate readings, CTG monitoring is associated with high false positive rates and inconsistent interpretations, both of which contribute to an inability to accurately predict fetal hypoxia [9].

### 3.2 Ongoing Fetal Heart Rate Monitoring in Active Labour

The second component of the ISIA framework describes the protocol for IA during active labour and the management options when the fetal heart rate findings on auscultation are abnormal. There are two main elements in the ISIA framework for ongoing FHR

monitoring (Figure 3). They are an assessment of risk factors that may develop during labour, and how IA is performed and interpreted. A third element describes management options when the FHR is abnormal.



**Figure 3:** ISIA Ongoing IA in Active Labour [7,8]

IOL – Induction of labour; Cx – Cervix; FHR – Fetal Heart Rate; IA – Intermittent Auscultation; CTG – Cardiotocograph; UA – Uterine Activity

*3.2.1 Risk Assessment: Assess for Intrapartum Risk Factors for EFM*

The second phase of assessment is a dynamic process that continues throughout the woman’s labour and may mandate a shift to continuous monitoring, or alternatively, preserve confidence about the suitability of intermittent auscultation. Fetal monitoring guidelines recommend continuous CTG if risk factors develop during labour and these are listed in the ISIA framework (Figure 3).

*3.2.2 Intermittent Auscultation Protocol*

To use ISIA in normal active labour, the midwife must be able to provide one-to-one care. This means the midwife is providing care for only one woman in active labour at any one time. A midwifery model of care where continuity of care is a key principle enables this to

happen. The Society of Obstetricians and Gynaecologists of Canada (SOGC) have recognised the importance of one-to-one care for labouring women in their 2007 fetal monitoring guideline by acknowledging that midwives are really caring for two people; the woman and her unborn baby [36]. The provision of continuous support during labour, facilitated by one to one care, is upheld by evidence that indicates this practice model reduces interventions [37, 38]. In this part of the ISIA framework the frequency, timing and duration of IA are described, along with documentation of other findings such as maternal pulse, fetal movements and uterine activity.

Current fetal monitoring guidelines vary in their recommendations for IA in the first and second stages of labour. However, the most commonly recommended frequencies for fetal heart rate auscultation are every 15 to 30 minutes during active first stage of labour and every five minutes or after every contraction in second stage, and the duration of counting of the FHR is for 30 to 60 seconds, with 60 seconds the most optimal duration. Timing of auscultation in the majority of texts and guidelines is from the end of a contraction [1, 2, 4, 17]. Historical midwifery textbooks provide a clue as to why auscultation is done from the end of a contraction. In the first edition of *Textbook for Midwives*, Margaret Myles (1953) stated that the FHR was never auscultated during a contraction since oxygen to the fetus would be reduced at this time and so this would not be a true reading of the fetal heart rate (Myles, 1953; as cited in [39]). The rationale for auscultation of the FHR after the contraction is twofold. Firstly, the FHR decrease that returns to the average FHR (baseline) before the contraction ends is unlikely to be harmful to the fetus. In addition it is irritating to the woman if a fetal stethoscope or Doppler is used during a contraction. Thickening of the myometrium during contractions also reduces the ability to hear the FHR clearly. Most of the harmful FHR decreases are late, atypical, variable, and prolonged decreases and can be identified by auscultation immediately after a contraction..

#### *Normal IA Findings*

When the findings from all assessments are normal, continued IA is appropriate. Normal is defined as: the average FHR is between 110 bpm and 160 bpm, there are FHR



increases and no FHR decreases, and the fetal heart rhythm is regular. As with the admission assessment component, the maternal pulse must be palpated in conjunction with fetal heart auscultation to differentiate between the two heart rates.

Monitoring of uterine activity should reveal normal activity and tone. Each individual woman will experience labour differently with a range of contraction frequency from one every three minutes to one every 10 minutes (Thorpe & Anderson, 2010), as cited in [40]. Normal contractions are classified as less than five contractions in a 10 minute period, while an abnormal contraction pattern is when there are more than five contractions in a 10 minute period (also known as tachysystole). Tachysystole is further qualified by the presence or absence of fetal heart rate decelerations [24]. Documentation of FHR, uterine activity, and fetal movements provide ongoing evidence of decision-making during labour. An example of how this can be documented is provided in Table 2.

**Table 2: Sample documentation when ISIA informed decision-making framework is used for ongoing fetal heart monitoring.**

|   |   |   |
|---|---|---|
| <p><b>Date and time</b><br/>25/9/11<br/>1030hrs</p> | <p>FHR – 136bpm, auscultated with a Doppler device for 60 seconds from the end of a contraction no decreases in the average FHR heard. FH Rhythm is regular, increases to 155bpm heard with FM. Maternal Pulse 86bpm. Contractions are 3:10, strong to palpate and lasting 60 seconds. Uterine resting tone between contractions is soft. Maternal Pulse 86bpm.<br/><i>+(Narrative about the woman and how she is coping with her labour)</i></p> | <p><b>Signature and designation</b></p> |
|---|---|---|

### *Abnormal IA Findings*

Abnormal fetal heart rate findings include an average FHR above 160 bpm or an average FHR below 110 bpm; a rising average FHR; gradual or abrupt decelerations; and an absence of FHR increases or irregular fetal heart rhythm. Consideration should be given to potential causes and further actions. Should risk factors become evident during labour, for example meconium or blood stained liquor, need for oxytocin augmentation, or vaginal bleeding, FHR monitoring should convert to continuous CTG [17]. It is recommended that the FHR be assessed before and after any labour interventions e.g., artificial rupture of the membranes (ARM), the administration of medications, analgesia/anaesthesia, spontaneous rupture of the membranes (SRM), vaginal examination (VE), and abnormal uterine activity patterns (increased tone or tachysystole), or any untoward event during labour (e.g., maternal hypotension) [41]. Excessive uterine activity or increased uterine tenderness and/or tone are both abnormal findings that warrant follow-up.

Factors contributing to these abnormal fetal heart rate findings include: maternal or fetal temperature elevation/ infection, dehydration, maternal smoking, medications and illicit substances, maternal distress, prematurity or advanced gestational age, maternal anaemia, chronic hypoxia and acidosis, excessive uterine activity, maternal position (e.g., supine), maternal hypotension (related to drugs or regional anaesthesia), umbilical cord compression or cord occlusion, fetal cardiac conduction or structural defect, uterine hyperstimulation or hypertonus, maternal condition affecting the placenta (pre-eclampsia, diabetes), placental changes affecting uteroplacental gas exchange (abruption, post maturity aging, malformation, placenta praevia), rapid fetal descent, vaginal examination, uterine rupture and fetal bleeding (ruptured vasa praevia) [12, 35]. The management options for abnormal FHR findings are considered next.

#### *3.2.3 Consider Management of Abnormal Audible FHR during IA*

Among the management options to consider if there is an abnormal FHR is staying present with the labouring woman because this helps to reduce maternal anxiety. The link between maternal anxiety and fetal heart rate abnormalities is clear when one understands

the Fear Cascade theory described by several authors including Foureur (1998), who explains it as: “[fear results in] increased catecholamine (adrenaline) [that] constricts blood vessels, decreases uterine blood flow, reduces placental perfusion, decreases fetal oxygenation and as a consequence increases fetal distress [42].

Consideration must also be given to other management options when there is an abnormal FHR on auscultation. These include: repositioning the woman to increase utero-placental perfusion or alleviate cord compression, ruling out fever/infection, dehydration, drug effect, maternal anxiety and/or prematurity, correcting maternal hypovolaemia by increasing fluids, including the administration of IV fluids, performing a vaginal examination to assess for the presence of a prolapsed cord or to relieve cord compression, and checking the maternal pulse and BP.

Additional measures include the need to continue to auscultate the fetal heart rate and doing this more frequently. Furthermore, consideration needs to be given to initiating continuous CTG and fetal scalp blood sampling, consultation with midwifery and obstetric colleagues, and expedited delivery.

#### 4. Discussion

The clinical problem triggering the development of the ISIA framework was the knowledge that low risk women birthing in institutional maternity units were increasingly exposed to the use of CTG, both on admission to hospital and continuously during labour. With the ubiquitous presence and availability of technology in the birthing room, and the increased use of epidural anaesthesia and oxytocin in ‘normal’ birthing women [43], the choice and use of intermittent auscultation for low risk women was threatened.

Intermittent auscultation is the evidence-based fetal heart rate monitoring modality recommended by professional obstetric and midwifery organisations in their fetal monitoring guidelines. On the basis of current evidence there is little clinical justification for the continued routine use of CTG monitoring for low risk women. Therefore, factors other than research evidence [43] appear to influence decisions regarding choice of fetal heart

monitoring modality. It is also known that with an increased reliance on the CTG machine midwives are becoming deskilled in the essential midwifery skills of auscultation and palpation [44, 45].

The ISIA decision-making framework is an example of third generation knowledge. That is, it is a knowledge translation tool to support the application and implementation of evidence into practice around the use of intermittent auscultation as a FHR monitoring method for low-risk women. The framework is informed by physiology of the materno-utero-placental unit and control of the fetal heart. Unique to this ISIA framework is the inclusion of fetal movements and auscultated FHR increases, which are assessed on admission and throughout labour as indicators of fetal well-being. For the intrpartum care provider to be able to quickly and skillfully assess and correct potential fetal compromise, they must have a thorough comprehension of the contributions of the maternal, placental, and fetal circulations to normal fetal oxygenation [35]. This knowledge of the physiology and the physiologic responses of the fetal to changes in oxygenation should guide the intrapartum care provider to select the appropriate interventions and/or determine the need for further evaluation [12].

## 5. Conclusion

ISIA provides midwives with a robust means of demonstrating their critical thinking and clinical reasoning around fetal heart rate monitoring using intermittent auscultation and supports their understanding and belief in normal physiological birth. Understanding the evidence supporting the use of intermittent auscultation for low risk women and the physiological underpinnings of a framework such as ISIA gives midwives strength to act as guardians of normal birth. Most fetal monitoring guidelines simply provide a protocol for IA outlining the frequency, timing and duration of IA. The ISIA decision-making framework has re-established the validity of IA as a fundamental midwifery skill. We recommend that fetal monitoring guidelines be amended to include a more comprehensive description of how to use ISIA for admission assessment and ongoing FHR monitoring.

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