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Scope for improved Intermittent Auscultation (IA) regime mitigating serious systemic risks, for wider acceptance in American, British and International Practice

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Abstract
Cases of serious birth asphyxia continue to occur following suboptimal and apparently well-conducted Intermittent Auscultation (IA) raising questions of accuracy and reliability. Systematic-reviews have provided questions but hardly any answers. This analytical review suggests improvements in safety and practicality of IA using advances in technology and accumulation of observational evidence in clinical cases including knowledge from cardiotocography. The terminology 'Auscultation' can translate to a mistaken ideological commitment to 'actual/manual counting' of audible fetal heart rate (FHR) tones. This routine practice should be questioned/reconsidered when the modern hand-held Doppler devices continuously display a concurrent accurate FHR, not possible by counting. Furthermore, actual case studies show that the FHR abnormalities could be misinterpreted with a single-count or may extend beyond one minute. A reanalysis of the investigation by the 'National Health Service (NHS) Resolution' in UK shows that it was unfair to hold midwives primarily responsible for adverse outcomes because of not rigidly following the IA regime by the National Institute for Health and Care Excellence (NICE, UK). The serious pitfalls associated with the single-count methodology of NICE and similar IA regimes seem to predispose midwives to systemic errors with continuing risk to babies. In contrast, the American College of Nurse-Midwives proposes a better multiple-count method. The British midwives have not adopted similar multiple-count method finding it cumbersome in first stage and impossible (every five minutes) in the second stage. This article enables midwives to compare the safety of different IA regimes including the recent 'Advanced Intermittent Auscultation (AIA)' which does away with manual counting. The AIA also opens an additional possibility for Nurse-Midwives to make a fair judgement of the baseline variability of FHR (although non-mandatory), addressing a concern by some clinicians with IA. Nurse-Midwives have a crucial role in selecting a safer more efficient IA enabling more choice for women.

Keywords: Intermittent auscultation, advanced intermittent auscultation, Intrapartum Fetal monitoring, fetal asphyxia, late decelerations, fetal heart rate decelerations

Introduction
Intrapartum fetal asphyxia can have devastating and life-long consequences. The continuous electronic monitoring (cardiotocography) is the main method used in the USA. The Intermittent Auscultation (IA) is less practiced, may be in 10% cases (Personal correspondence with an American expert). The North American, British and other maternity organisations have issued guidelines for IA together with detailed systematic analysis of available evidence [1-5]. These guidelines are emulated world over. IA is accepted and often recommended as a suitable method for low-risk labor in Europe, Canada and Australia New Zealand, with advantages of reduced operative intervention and morbidity thereof [2-5]. The midwives in UK are mandated to follow IA guidelines by the National Institute for Health and Care Excellence (NICE) [2, 3] or Intelligent Intermittent Auscultation (IIA – single or multiple-count versions) [6-8] or Physiological IA [9]. A substantial proportion of recommendations in the guidelines for intrapartum fetal monitoring have to be arrived by expert consensus (level 3 - 4 evidence) because of major difficulties in conducting large scale randomised controlled trials (RCTs) in this field [1-5] and few will be forthcoming. Most IA regimes continue to follow methodology from 1960s based on practice / consensus before the

hand-held Doppler devices were available in clinical practice [10]. With suboptimal as well as apparently well conducted and documented IA, cases of birth asphyxia continue occur, a proportion of which could be preventable [11]. Following investigations into many such adverse perinatal outcomes, the 'National Health service (NHS) Resolution' in 2020 widely publicised its concerns describing a fictional but purposely constructed illustrative case story to exemplify learning lessons [12]. Contrary to its assertion, the re-analysis presented in this article shows that it seems mistaken to hold midwives largely responsible for these cases of serious fetal hypoxia and to continue to demand rigid and stringent adherence to the NICE IA guidance [2, 3] as a solution. This article aims to enable Nurse-Midwives to assess if there is continued serious systemic risk to the babies and themselves embodied in the current IA guidelines using a single-count of fetal heart tones over a minute after contraction. The article promotes a debate as to how to exploit the full potential of the modern Doppler devices to achieve greater practicality, efficiency and patient safety. That should also bring IA more in line with cardiotocography (CTG) increasing its acceptability in the North American practice but still retaining its low-tech nature and associated advantages in low-risk labors and less medicolegal costs.

This review takes an analytical or narrative approach in contrast to many Systematic Reviews which readers may perceive to have raised more questions than provided answers for progress. It was indeed a Non-systematic Review [13] which first highlighted the fallacies of single-count IIA [6] (and mentioned 'multiple count' method in British literature, although as a redundant technique) following which the Oxford Academic Health Science Network (AHSN) in 2020 progressed to its multiple-count IIA [7]. This article focuses on IA performed with Doppler device which has become a default worldwide; IA with Pinard stethoscope is not the main subject of this review. The debate of IA versus CTG or admission CTG is also not within its remit.

Quick Points

- Serious systemic risks seem embodied in the current IA regimes using a 'single-count' methodology.
- Midwives could be forced into errors and unjustly held responsible for adverse outcomes.
- 'Multiple/fractional-count IA' has been found to be impractical to be performed every five minutes in the second stage.
- The term 'auscultation' does not equate to manual counting.
- Safer IA regime, exploiting the advantages of hand-held Doppler devices, should abandon manual count and focus on the fetal heart rate number displayed.

The rationale for IA regimes

It is widely accepted that the current IA regimes are based on expert consensus only [1-5]. What is less realised is that the methodologies of IA (e.g. timing, frequency and duration) were constituted around 1960sm, well before the modern handheld Doppler devices became available in practice [10]. In the absence of RCTs, quality improvement articles and critical analyses of state of science (often without Level 1-2 evidence) published in medical journals together with evolving professional understanding /opinion form an important substrate for the experts to arrive at a consensus.

The current prescribed frequency / duration of 'counting' of fetal heart tones comes from those adopted by the old Dublin randomised trial in early 1980s [10]. However, doubts have been raised if this frequency of 'counting', especially every 5 minutes in the second stage, can be achieved [14]. A prospective study reported that the protocol for IA was successfully completed in only 3% of cases [15]. The midwives have become better at achieving this high burdensome task by devoting increasing amount of effort. However, does this come at the expense of 'thinking time' and 'human attention bandwidth' important for drawing inferences and decision-making? Why do they have to count when the modern Doppler devices do it far better and show the instantaneous contemporaneous fetal heart rate (FHR) very accurately, not possible by counting? The resistance to change should not be underestimated even in hard/pure sciences, not to speak of a soft 'applied' science like medicine. We should endeavor to prove Max Planck wrong, a German theoretical physicist with a Nobel prize for quantum theory, who rhetorically exaggerated, "A scientific truth does not triumph by convincing its opponents and making them see the light, but rather because their time is over". Additionally, safety changes in medicine can sometimes be delayed due to organisational inertia, indecisiveness and medico-politics.

Auscultation need not equate to counting

The clinical term 'auscultation' means listening to sounds generated within a living body generally using a stethoscope. A common procedure is auscultation of lungs which involves no counting. Even auscultation of heart sounds in children and adults rarely involves counting the heart rate, which is done by counting the pulse and now invariably done by machines. Language and terminology should not hinder progress. Thus, the term 'IA' need not mandate actual/manual counting of audible tones. Hence, a fundamental question begs a satisfactory answer as to why continue to do a manual count of FHR except in selected situations or fewer times. IA differs from CTG in not continuously recording an FHR trace on a paper. IA could be interpreted as listening to audible fetal heart tones while observing and interpreting the digital FHR displayed on the hand-held Doppler devices which are now most commonly used and widely available even in many rural areas in the developing world.

Methodology of the Review

In addition to examining the very fundamental basis of IA, a wide literature search was made for scientific evidence (low and high grade) for different regimes of IA [1-9]. All guideline-makers in their systematic search for evidence found that high quality level 1-2 evidence was not available for many aspects intrapartum fetal monitoring (Also true to more or lesser extent for most medical guidelines) [1-5]. During this review, it was also debated if the decades-old limited RCT evidence would be still valid if the technology has substantially advanced opening new possibilities. A recent detailed

scoping review of IA concluded that no definitive conclusions can be drawn or recommendation made regarding choice of different IA regimes [16]. Its only definitive conclusion was that there was no evidence to recommend Doppler device instead of the Pinard for IA, or vice versa [16]. However, it seems a moot point because the vast majority of birth attendants world-over have been using Doppler device instead of Pinard for last many years because several definitive practical advantages [13]. Furthermore, the clinical studies comparing doppler device versus Pinard stethoscope have been shown to be invalid or inapplicable to the current practice [13]. A Cochrane Systematic Review also criticised the clinical trial evidence of Doppler device versus Pinard as of 'very poor' quality with high risk of bias [17].

With paucity of high-quality evidence, it was considered that the expert consensus should involve critical and detailed reasoning with all questions asked, reasonable answers sought, uncertainty acknowledged (a strength of science) and safe accommodations made. During the literature search, an investigation report by the 'NHS Resolution' [12] was encountered which provided a very good substrate to test different approaches to IA in clinical setting. A critical reanalysis of this investigation was performed to test its validity applying basic mathematical principles (purest scientific evidence) because counting numbers was involved during IA. Several IA regimes were compared to see which ones most fulfil the scientific and practical requirements and offer future potential.

Investigation by the 'NHS Resolution'

The panels appointed by the Maternity and Newborn Safety Investigations (MNSI) program of NHS England [18] have been investigating every case of severe birth asphyxia /stillbirth in the country for many years and providing formal investigation reports to the health-workers, hospitals and patients involved. These have been available to the "NHS Resolution" (previously called 'Clinical Negligence Scheme for Trusts'), an arm's-length body of the Department of Health and Social Care of UK [19]. It provides expertise to the NHS on resolving concerns and disputes fairly, sharing learning for improvement and preserving resources for patient care. It aims to provide practitioner performance advice: managing concerns raised about the performance of doctors, dentists, pharmacists; and in this case midwives [12, 19]. It also claims to dictate the safety and learning: helping providers of NHS-care to understand their own claims-risk profiles to target safety activity and share learning across the health service nationwide [12, 19].

In 2020 in UK, the 'NHS Resolution' took a remarkable step to widely publish lessons from its investigations into many serious incidents of severe fetal asphyxia in labor following IA [12]. It presented a hypothetical example of a baby requiring head cooling and leading to grade 2 hypoxemic Ischemic encephalopathy (HIE) with high risk of cerebral palsy. The details of this fictitious case were constructed to explicitly illustrate the recurrent real mistakes in practice and then derive conclusions and enforcement based on these details. In that sense, the details of the case can be considered 'hyper-real' even if fictitious. Its aim was to dictate the safety and learning in IA for midwives and obstetricians in an open and transparent manner from many similar cases NHS had encountered. Hence, any critical reanalysis must look closely at the case details which enabled the conclusions and not just at the intention or the spirit.

The detailed description by the NHS Resolution [12] constitutes a case of a primigravida in low-risk labor who was monitored with IA throughout the labor. The midwife was transparent in documenting that she was able to perform IA at intervals between 4 and 10 minutes (thus about every 7 minutes on average) during the 90 minutes of confirmed second stage. After 90 minutes of active pushing, a CTG was started which showed a high baseline FHR of 160/min and recurrent deep variable (late in timing) decelerations [12] The 'NHS resolution' asserts that if the midwife had done auscultation without fail at least every 5 minutes according to the NICE guidelines [2, 3] (i.e. 18 times in 90 minutes plus 8 times during 40 minutes of involuntary pushing); then that very act alone, by some virtue, would have detected the FHR abnormalities and prevented the adverse fetal outcome. The midwife is also criticised for not counting FHR every 5 minutes for additional 40 minutes of urges of involuntary pushing before the vaginal examination confirming full dilatation and start of active pushing. Thus the 'NHS Resolution' [12] seems to suggest that the abnormal FHR changes seen on CTG started shortly before delivery would have been present / detectable for a few hours, which of course was agreed or considered very likely during this review, given the severity of birth asphyxia.

Outcomes of the Review

The reanalysis inferred that the midwife did count the FHR for about 13 +/-2 times in the 90 minutes of the second stage (once every seven minutes on average) and 2-3 times during the 40 minutes (i.e. once every 15 mins) of involuntary/passive pushing but completely failed to detect the high baseline FHR as well as the deep decelerations after the contractions. Hence, the crucial question overlooked by the 'NHS Resolution' [12] is why the midwife missed FHR abnormalities about 13 times in 90 minutes and whether she followed a wrong methodology, rather than why she did not repeat the same method for five more times in 90 minutes. The 'NHS Resolution' insists that the midwives must follow the mandatory and strict methodology recommended by NICE, IIA or Physiological IA guidelines that the fetal heart tones must be counted for at least one minute after contraction (single count) and written down as a single number (presumably representing the baseline FHR) [2, 3, 6, 9]. Indeed, the 'NHS resolution' has confirmed that the part of the one minute of auscultation after contraction would have encountered a deep deceleration and a part reached the high baseline of 160/minute (or a bit more) as revealed by the CTG before birth [12]. With that specified knowledge of the CTG record, an application of basic numerical principles reveals that a count performed over that full minute written as a single number would average the deceleration and high baseline and be well below 160/min, could be around 130-140/ min i.e., very much normal (Figure 1). Therefore, the midwife did not have a chance to detect the high baseline of 160/min, precisely and primarily because she was mandated to follow the methodology [2, 3, 6, 9] of a single count. Similarly, focusing

on this irrelevant single number meant that she could miss any decelerations as well. The NHS Resolution also holds the midwife responsible for failing to detect the progressive rise in FHR baseline. Notwithstanding, the single number documented never represented the real baseline, and would vary up and down, depending on the varying depth and duration of the deceleration within the minute of 'counting'. Furthermore, we have come across cases where a high FHR baseline is reached after or towards the end of one minute [12]. The NHS resolution does not give details of FHR baseline trend throughout the labor nor illustrates the CTG started before the delivery. It does not state that the FHR baseline rose by 20 beats per minute (bpm) or more compared to that in early labor which could have prompted starting a CTG. However, in any case this new recommendation was made by NICE [3] only in December 2022 i.e. much after the investigations. Furthermore, a baseline rise by 20bpm on its own would not account for severe birth asphyxia leading to grade 2 HIE.

Another regime termed 'Structured Intelligent Intermittent Auscultation' has been proposed with a small feasibility study [20]. The original IIA [6] and NICE regimes [2, 3] also have structures underpinning them. Moreover, this paper does not study clinical outcomes, indeed it includes very small numbers for this to be possible [20]. Despite the repeated failure of compliance by midwives, the NHS Resolution [12] or NICE [3] have not suggested the 'structured IIA' for lack of any additional benefit or practical advantage. Furthermore, the 'Structured IIA' rigidly insists on a 'single-count' [20] and hence would perpetuate the associated fallacies and risks, as discussed above.

The American College of Nurse-Midwives (ACNM) has adopted a multiple/fractional-count methodology which overcomes the fallacy of the misleading 'single-count number'. However, the minimum 30 second duration recommended by ACNM could potentially miss pathological FHR abnormalities if a late deceleration (still within normal FHR range e.g. down to 120-130 bpm) lasts for over 30 seconds and a high baseline of 170 bpm or more is reached later, e.g. after 45-60 seconds [11]. The American Nurse-midwives should also question why it is necessary to perform an actual count at all. The British midwives have not found it possible to perform a complicated formal multiple-count IA [7, 8] every 15 minutes and even more so every 5 minutes during passive and active pushing (web based search and personal communications). Readers are referred to a webinar by the Oxford AHSN to assess the complexity or impracticality of the multiple-count IA proposed in the UK [7]. We have come across instances where the British investigatory bodies have recommended IA every 5 minutes for up to 4 hours during case investigations in the event of prolonged period of involuntary urges to push. Furthermore, the NICE guidelines [2,3] would have prevented very valuable selective and flexible extension of auscultation beyond one minute because it would generate a second number contradicting the guideline (in addition to the invariable tendency to stop the tiresome counting to a high number of about 140 at the 'natural' end of one minute). A recently proposed 'Advanced Intermittent Auscultation (AIA)' [21, 22] would override these risks. The fallacies of a single count and also some imprecision of multiple-count are demonstrated in figures 1 and 2. The figure 1 clearly demonstrates that a single number generated by counting the FHR for 1 minute after the contraction would give a figure of about 140/min, completely missing the high baseline of 170/min as well as the deep late deceleration, as could have happened in the cases encountered by the NHS resolution. Thus, the NICE [2, 3] and similar methodologies [4, 5, 6, 9, 20] of 'counting' to generate a random irrelevant single number can be seen to fail or mislead the midwife at the most crucial times, which is when decelerations are present during part of the minute after contractions.

Scientific and practical merits of available IA regimes

A comparison of different IA regimes has been summarised in Table 1 in a concise form. It may need repeat visiting due to the complexity of multiple concepts listed. The readers can assess any continuing systemic risk to the babies from a single-count IA like the NICE guidelines [2, 3] from the preceding discussion in this review. Following a mention of the 'multiple-count IA' (as an outdated method) in a British publication, [13] the Oxford AHSN [7] has heavily promoted this outdated technique in the UK. The K2MS™ Perinatal Training Program (PTP) [8] was the only UK organisation which answered queries during this review. The K2MS™ confirmed that it has adopted the Oxford AHSN multiple-count IA [7] on the demand by the interest groups and would be further guided by midwifery opinion or consensus. The web-based search during this review has revealed that no maternity units in the UK have adopted the AHSN or K2MS™ IA regimes [7, 8] finding them impractical. More importantly, these are unnecessary with the availability of Doppler devices (Table 1). K2MS™ is a Plymouth, UK based Fetal monitoring training organisation whose training modules have constituted a mandatory yearly training in the UK for midwives and obstetricians for a couple of decades [8]. The K2MS™ is also available in the USA and Australia with over 180,000 users worldwide [8]. The K2MS™ has stated to us that it is not within its remit vouch for the reliability or practicality of the AHSN IA module it has adopted. This review (Table 1) should facilitate the K2MS™ to reassess its choice of the IA regime considering the patient safety issues. Such organisations can then influence the relevant Royal Colleges in the UK. Table 1 also highlights that the AIA [21, 22] is the only regime which does away with manual counting of FHR tones leading to several advantages, alluded to next.

Table 1: Detailed comparison of different regimes of Intermittent Auscultation (IA)

1. **American College of Nurse-Midwives (ACNM): Fractional or Multiple-count IA** [1] 2. **Modified Multiple-count version of Intelligent Intermittent Auscultation (IIA)** [7]**, (also adopted by K2MS™)** [8]	**Intermittent Auscultation (IA) by NICE, UK (Single-count IA)** [2,3]	1. **Intelligent Intermittent Auscultation (IIA): the primary Single-count version** [6] 2. **Physiological Intrapartum Fetal Monitoring (Single-count IA)** [9]	**Advanced Intermittent Auscultation (AIA)** [16,17]
Mandate actual counting of fetal heart tones separately during intervals of 15 seconds over one minute. This modification has been adopted after a demonstration that a single count cannot represent FHR baseline and periodic variations. Remarkably, this serious systemic weakness seems to persist in IA by NICE [2,3] and Physiological IA [9].	Mandates actual count of fetal heart tones for one minute after contraction and write it down as a single figure.	Mandat actual count of fetal heart tones for one minute after contraction and write it down as a single figure. IIA mistakenly claimed that the rate over a "steady" period should be taken as baseline FHR even though that rate is not counted separately and hence unavailable.	AIA recommends not to actually count the fetal heart tones but observe the FHR rate figure displayed on the doppler device screen for one minute starting towards the end of a contraction. The Doppler display shows the instantaneous FHR which is as accurate as the FHR plotted on the CTG.
A very complex mental arithmetic of the four figures obtained over one minute is required which gives average rate over each 15 second interval. Despite this **only rough judgement of FHR variation** can be obtained. Amplitude and duration of FHR variation cannot be judged. Because of high complexity the British midwives have not adopted it.	A single count over one minute gives an average over one minute which does not represent the baseline heart rate nor any accelerations or decelerations when the FHR has varied over the auscultation period. Focus on this irrelevant single number ignoring the FHR displayed on Doppler device seems **to incorporate a systemic risk of missing crucial FHR abnormalities with potential for serious birth asphyxia.** The advocated "Listening" to any decelerations while concentrating on counting to about 140 is subjective, imprecise and lacking judgement of depth/duration.		**The AIA allows the best possible judgement of FHR baseline and FHR variations** even compared to the complex modified multiple count version of the IIA. Any decelerations and accelerations are better detected with more reliable (if not perfect) observation of amplitude and duration, which is not at all possible by other methods involving actual counting of the fetal heart tones.
Further complex calculation required if auscultation needs to be extended. The 30 second minimum duration by ACNM [1] has potential to miss some pathological FHR variations [11]. Strong natural inhibition, reluctance and difficulty to flexibly extend auscultation.	**Make valuable flexible extension of auscultation duration almost impossible.** Natural bar, inhibition or reluctance to extend auscultation. After counting to about 140 for a minute, one would almost always stop and not continue instantaneously**. A second different number generated would also contradict the guidelines.**		**AIA** is very easy to extend to continue to observe the FHR beyond one minute when in doubt. When there is a late deceleration at the beginning of auscultation, then FHR baseline can be much better judged just before the beginning of next contraction.
Seems impractically / excessively effort-intensive and tiring. **Impossible to perform every 5 minutes during involuntary pushing and second stage** in British practice. Moreover, less accurate assessment of FHR variations compared to AIA [16, 17].	Counting repeatedly especially during second stage and involuntary pushing before full dilatation is effort-intensive, tiring and **leaves little time and attention bandwidth for careful thinking and decision making.** Some midwives have raised a concern that it cannot be practically done every 5 minutes in the second stage.		**AIA** is user-friendly, labour-saving and non-tiring as well as more accurate. Can be extended or repeated with ease. Allows more thinking time even during the auscultation.
Even repeated multiple-count method cannot give any judgement of (short-term) baseline variability.	No method or amount of actual counting will give any idea about the (short-term) baseline variability.		Although the assessment of (short-term) baseline variability is not essential in low-risk labours, the AIA opens up the possibility of subjective judgement of baseline variability.
Actual counting seems **an outdated technique** when the Doppler device displays an accurate concurrent FHR and its variations. The term 'auscultation' does not equate to counting. All counting-based regimes would hinder future progress and developments of IA.			**AIA** utilises full potential of the modern Doppler devices which is only possible when actual counting is consigned to past. The f**orward-looking AIA opens opportunities for future progress**.
NICE [2,3], IIA [6,7] and Physiological IA [9] mandate a rigid approach to frequency and duration of auscultation, largely continuation of the past.			AIA undertakes broad empirical scientific approach also incorporating from knowledge from CTG. Further optimisation IA regime with broad consensus will improve detection of abnormal FHR patterns and thus **improve practical performance and efficiency of IA and thereby perinatal outcome**.

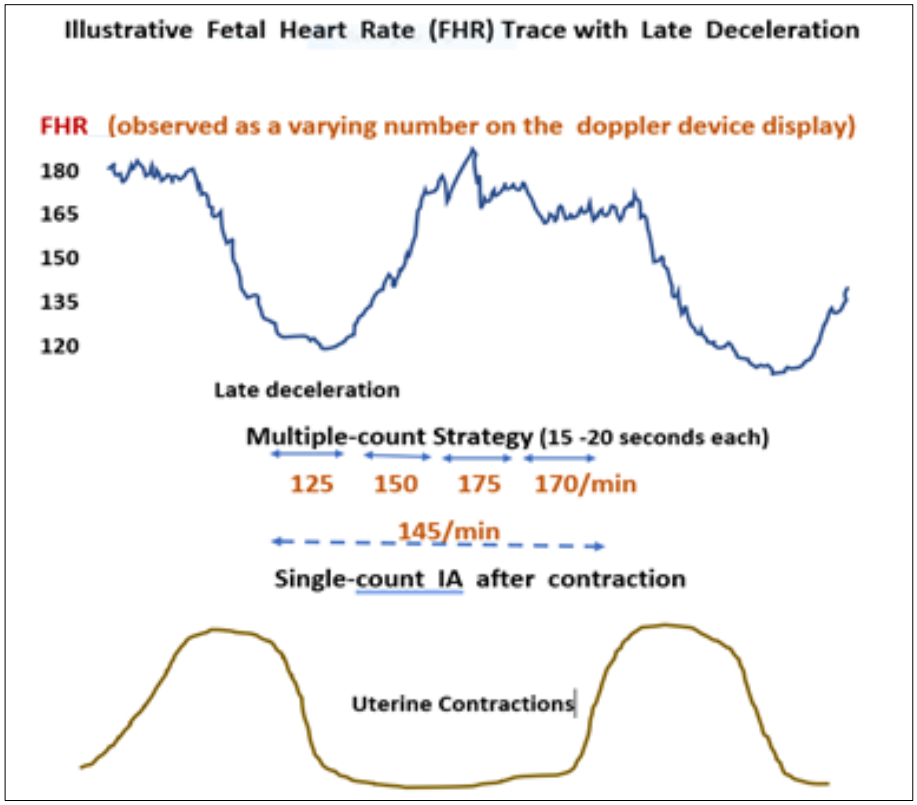

Fig 1: Schematic illustration of IA of FHR with late deceleration: Care is required not to mistake the recovering late deceleration as an acceleration. An actual count of fetal heart tones over 1 minute gives a figure of about 140/min, not representative of the baseline of 170/min and the late deceleration down to 120/min. Even the cumbersome 'multiple-count strategy' is less accurate than simply observing the numerical FHR display on the Doppler-device because the deceleration / acceleration is likely to spread across the two consecutive counting epochs of 15 or 20 seconds.

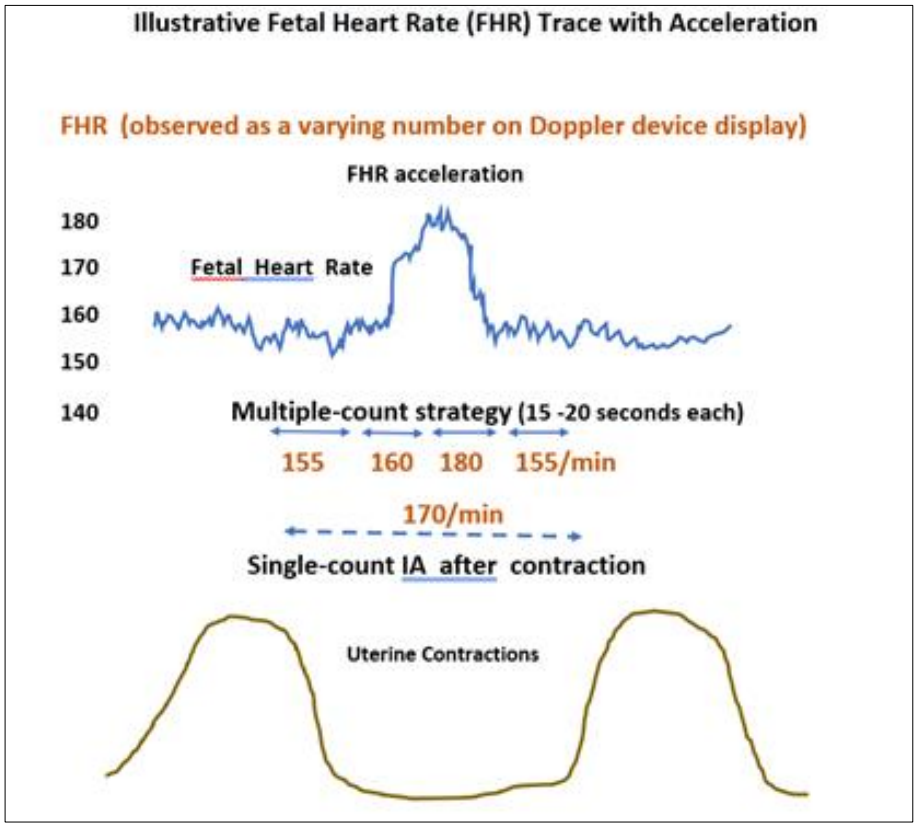

Fig 2: Schematic illustration of IA of FHR with acceleration: An acceleration can be inferred when a rise of FHR of 15 bpm or more is observed on Doppler-device display, preceded by a normal FHR baseline and returned to it after the acceleration. This is difficult to detect precisely while counting fetal heart beats for a minute. A single count spuriously gives an abnormally high figure (170/min) instead of a true baseline of 155/min. NICE [2, 3] mistakenly commands this spuriously abnormal number to be documented for a particularly reassuring normal FHR pattern as above.

Advanced Intermittent Auscultation (AIA): North American and British context

The principles of the "Advanced Intermittent Auscultation (AIA)" have been proposed over the last decade followed by publication of a training module [21, 22]. The AIA retains the simplicity of IA while maximising the benefits of modern but simple technology of Doppler devices, thus potentially improving efficiency, reliability, accuracy and safety of IA (table 1). Its foundational aspects have been described in detail [22]. The ideological commitment to manual 'counting' has been critically questioned [22]. The main objection to discontinue/abandon the manual count in UK has been a mistaken belief that the FHR displayed on Doppler device is not reliable [9]. Indeed, the British midwives are instructed to ignore the FHR displayed on the Doppler device. They are taught to focus on the single number generated by the manual count [2, 3, 6, 9] so much so that some NHS hospitals are debating whether to switch over to Doppler devices with audible tones only without FHR display (personal communications). There are very rare situations where the Doppler device may double or halve the FHR due to poor signal, but the Nurse-Midwives are well versed with detecting and overriding such rare situations during their on-going substantial experience with the CTG which uses the same Doppler technology [21, 22]. These exceptions or errors should not make the rule. A manual count can be performed in these rare cases as a countercheck. Most importantly, a well conducted clinical trial published in a leading American Journal reported, "The accuracy of the heartbeat (Doppler) monitor was excellent compared with cardiotocography, with mean difference of −0.3 bpm only and 95th centile difference between −1.6 (CI −2.0 to 1.3) and +1.0 (CI 0.7–1.4) bpm, with intraclass coefficient 0.99. The FHR was detected on all occasions" [28]. It would be impossible to confirm an exact match, but these results are compatible with a precise match. It could be counterargued that the midwives are also observing the FHR display and inferring from it in addition to counting, but that is over and above or contradicting the guidelines. Nurse-Midwives may also be presented with an argument that there are no studies or Level 1-2 evidence to prove the efficacy of AIA. However, this does not seem a justifiable position for reasons already mentioned in this article. Misapplication of evidence-based medicine (EBM) should not make us blind to patient safety. If the purpose of repeated manual count is to judge the FHR, then that rate is continuously displayed on the Doppler device. Not having to count avails more attention bandwidth for interpreting FHR changes and decision making. Abandoning manual count provides AIA [21, 22] several other advantages like non-tiring, fairest measure FHR changes, easy to extend or repeat etc., as summarised in table 1. It is well within the skill set of midwives to observe the displayed FHR figure on the Doppler device and interpret temporal variation in FHR starting towards the end of contraction and continue till the beginning of next contraction [11, 13, 22]. It does not seem reasonable to argue that we will continue the less accurate misleading manual counts because that may reduce intervention rates. The author had a long hands-on experience of the multiple-count IA in low and high-risk cases from 1984 to 1992 in India when neither Doppler devices nor CTG were available across the country. That involved manual counting for 15 - 20 seconds followed by listening to the tempo of fetal heart tones and making a ball-park judgement in subsequent time segments until the start of next contraction. If a significant change in tempo was perceived, then the FHR was counted again for intervals of 10 -15 seconds. Such subjective assessment is not acceptable in current practice and guidelines. Furthermore, it is obsolete given the wide availability of Doppler devices which display an accurate concurrent FHR. If we were to start afresh today, then very likely we would not count but carefully observe the Doppler device display for temporal variations.

The AIA [21, 22] seems a natural progression of the multiple-count methodology of ACNM [1]. It is envisaged that if the safety of IA is perceived to be better because the AIA [21, 22] closely mirrors the FHR observation on CTG, then there would be grounds for better acceptability of IA in low-risk labors in the USA by women and birth-attendants. Additionally, a fair assessment of the FHR baseline variability seems feasible with AIA [21, 22] which would be a significant advantage in the North American context.

Conclusion

Intermittent Auscultation (IA) has been recommended in low-risk labors and has advantage of reducing operative intervention and medicolegal costs [1-5]. However, adverse perinatal outcomes do occur with IA as with CTG. Further debate is necessary to improve efficacy, practicality and safety of IA to gain more acceptance. Obstetricians trained in developed countries like the UK generally may not have practical experience and often interest in the IA. Hence, the Nurse-Midwives are in the driving seat and should take the lead. Therefore, Midwifery journals should encourage debate about improvements in IA. Modern hand-held Doppler devices are now widely used and display concurrent FHR accurately. AIA methodology involves observing the FHR display rather than manual count and would increase accuracy and safety of IA [21, 22]. This would also be very important for majority of the world population living in resource-poor countries where CTG is not available. Feasibility-trials of AIA should be useful after some initial computerised module-based training, subsequently opening the possibility for research projects and future progress. Independent organisations like K2MS™ with their praiseworthy work have a role to assess and petition for a safer IA regime [8]. The forward-looking AIA [21, 22] will enable the American and British midwifery practice to maintain their leadership in the field of IA and achieve future progress rather than remaining stuck in the past.

Interest statement

The author has no conflict of interest or funding to declare. The opinions expressed in this article have been formally and repeatedly raised with the British guideline-makers and professional bodies since 2014.

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