UK student midwives' theoretical knowledge, confidence, and experience of intermittent auscultation of the fetal heart rate during labour: An online cross-sectional survey

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ABSTRACT

Aim: This study aimed to explore student midwives' theoretical knowledge of intrapartum intermittent auscultation, their confidence in, and their experience of this mode of fetal monitoring.

Design and Setting: An online cross-section survey with closed and open questions. Descriptive statistics were used to analyse participants' intermittent auscultation knowledge, confidence, and experience. Reflexive thematic analysis was used to identify patterns within the free text about participants' experiences.

Participants: Undergraduate midwifery students (*n* = 303) from Nursing and Midwifery Council-approved educational institutions within the United Kingdom.

Findings: Most participants demonstrated good theoretical knowledge. They had witnessed the technique being used in clinical practice, and when performed, the practice was reported to be in line with national guidance. In closed questions, participants reported feeling confident in their intermittent auscultation skills; however, these data contrasted with free-text responses.

Conclusion: This cross-sectional survey found that student midwives possess adequate knowledge of intermittent auscultation. However, reflecting individual clinical experiences, their confidence in their ability to perform intermittent auscultation varied. A lack of opportunity to practice intermittent auscultation, organisational culture, and midwives' preferences have caused student midwives to question their capabilities with this essential clinical skill, leaving some with doubt about their competency close to registration.

Background

In the UK, all women in labour are offered surveillance to monitor for signs of developing fetal hypoxia. Continuous electronic fetal monitoring (EFM) is recommended for women at increased risk of developing fetal hypoxia during labour (NICE, 2017, 2022). In contrast, intermittent auscultation (IA) is recommended for women without risk factors for intrapartum fetal hypoxia (NICE, 2017, 2022). National guidance (NICE) recommends that IA should be performed by using either a Pinard stethoscope or a doppler device at regular intervals throughout labour. If no concerning features are heard, and the labour remains uncomplicated, IA continues throughout labour. However, if labour complications develop or concerning features are heard in the fetal heart rate pattern, the woman should be offered EFM. All midwives providing intrapartum care should be competent and confident in using EFM and IA. (NMC, 2019).

IA is endorsed by FIGO (2015), NICE (2022), and WHO (2018). However, successive reviews have noted how it is beset by errors such as inadequate antenatal and intrapartum risk assessment (Rowe et al., 2020), inappropriate timing of auscultation, poor technique, failure to detect or act on abnormal fetal heart patterns (RCOG, 2015; RCOG, 2018; RCOG, 2020; Rowe et al., 2020; Ockenden, 2022), resulting in the loss of fetal life or brain injury (RCOG, 2020).

Training and education have been cited as a means to overcome fetal monitoring errors (Brown et al., 2016; Gyllencreutz et al., 2017). However, evidence that it reduces neonatal mortality or morbidity is limited (Kelly et al., 2020). For undergraduates, research into intrapartum fetal monitoring training has focused on EFM and the impact of classroom-based activities, such as simulation (Daglar et al., 2020), e-learning packages (Wilson and Myers, 1998), aide mémoire (Mahey et al., 1999), and the use of mobile devices (Keegan et al., 2016). At the time of this study and to our knowledge, no studies have previously been

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undertaken on undergraduate learning of IA in the UK.

UK midwifery undergraduate students follow a three-year programme dividing their time equally between theoretical learning in Nursing and Midwifery Council (NMC) approved educational institutions (AEI) and learning in practice in AEI-aligned clinical areas. Factors such as curricula, good quality teaching, the learning environment, and the wider learning community all impact student proficiency. Learning in the classroom should be commensurate with that in clinical practice, and together, this can strengthen student midwives' sense of capability (Sidebotham et al., 2015).

At Cardiff University, the theory of IA is taught in three dedicated sessions each year for three years. Scheduled teaching sessions on fetal monitoring are focused on the physiological interpretation of fetal heart patterns and evidence-based practice. Anonymised case studies, presented by the faculty, are used for student learning. During class-based discussions about fetal monitoring, undergraduate students from Cardiff University recounted how they had experienced difficulties in gaining IA experience in their clinical placements and disparities between classroom-based IA theory and IA practice. This was concerning, as inconsistencies or variations in practices can cause students to feel overwhelmed (Gardiner and Sheen, 2016) and stressed (Greenway et al., 2019), causing impairment in their ability to assimilate clinical skills (Monaghan, 2015). Furthermore, if student midwives do not possess fetal monitoring skills at registration, this could contribute to clinical error. In response to student experiences, a study was undertaken using a cross-sectional online survey to explore this subject.

Aim

The study aimed to explore UK-based student midwives' theoretical knowledge, confidence, and experience of IA.

Methods

An online survey method was chosen to enable midwifery students in the UK to participate without geographical limitations. The survey was also designed to offer participants anonymity, reducing the potential for social-desirability bias. A narrative literature review conducted prior to the study informed the survey design. The survey (Appendix One) was developed by an expert midwife group consisting of a professor of midwifery, midwifery lecturers, and a range of midwives working in clinical practice. The survey employed closed questions including participants' demographic characteristics, study year, course duration, and AEI country. Multiple choice questions were used to assess participant's knowledge of IA against national guidance (NICE, 2017), including the fetal heart characteristics detectable with IA, recommended auscultation intervals in the first and second stages of labour, the timing of auscultation in relation to contractions, and recommended methods of IA counting techniques. Closed and open questions explored the experiences of students in practice. A multiple-choice question assessed participant knowledge of managing an abnormal fetal heart pattern detected in low-risk labour. Participants' confidence in their own IA skills and confidence in identifying normal and abnormal fetal heart patterns using IA were captured using five-point Likert scales, ranging from 'not at all' to 'extremely confident'.

Fifteen student midwives piloted the survey. This pilot confirmed face validity, found it was not burdensome for participants, and that questions were worded without ambiguity or surreptitiously influencing their responses (Ruel et al., 2016). Ethical permissions were granted by Cardiff University (SREC reference: REC765).

Recruitment

The eligibility criterion was students enrolled and actively participating in a UK-based pre-registration midwifery programme. The survey was publicised through Twitter between 1st February 2021 and 3rd March 2021 with a link to SurveyMonkey©, which included participant information, a consent form and the survey. Participants were asked to tick survey boxes to confirm consent. When consent had been provided, participants could access the survey.

Data management

Data were exported from the SurveyMonkey© platform into SPSS® version 25.0. Data were cleansed to ensure responses were unique and to look for evidence of 'ballot stuffing'. Free text entries were checked for evidence of automated answers. No evidence of this was found. GDPR principles (Data Protection Act, 2018) and Cardiff University information classification and handling policy were followed. Data were accessed via a sole-user, password-protected computer linked to the Cardiff University server.

Data analysis

Descriptive analysis and production of frequency tables were undertaken, and where appropriate, relationships between categorical variables were tested using Chi-square (statistical significance set at $p < 0.05$)

Free text data were analysed through the lens of critical realism using reflexive thematic analysis (RTA). This approach values the uniqueness of the participants' experiences. It also offered the opportunity to consider how some experiences can be readily observed, whereas other aspects remain hidden and operate outside what is already known or felt (Bhaskar, 1975). The six-stage process advocated by Braun and Clarke (2022) was used. Free-text answers were printed, read, and analysed semantically. Match Ware MindView 7® was used to establish data patterns and construct codes and subsequent themes (Appendix Two). Direct quotes were used to illustrate the themes and sub-themes identified. Quotes were anonymised but awarded a unique identifier for demonstrating context and offering data veracity. The identifying number related to the digital survey receipt, a letter signifying the participants' AEI (E: England, W: Wales, S: Scotland, NI: Northern Ireland) and year of study (i.e., year 1, 2 or 3).

Results

Of 363 responses, 30 (8 %) had not been completed, and a further 30 (8 %) offered no information other than the region of their AEI. After these exclusions, 303 survey responses were analysed, including 109 free-text comments. Of the 303 participants, 67.7 % ($n = 205$) were based at AEIs in England, with representation from the other UK constituent countries. The three-year Bachelor of Midwifery course was most represented with 96.7 % ($n = 293$), with participants at various stages of training (Fig. 1).

Most participants, 80.1 % ($n = 243$), had undertaken a clinical placement within six months of their survey involvement (Fig. 2). First-year student midwives were the most likely group not to have experienced a clinical placement ($n = 24$). Overall, more participants had worked in obstetric-led birth areas (OLU) (87.8 %) than in alongside midwife-led units (AMU) (68.3 %) or free-standing midwife-led units (FMU) (23.8 %). Encouragingly, by the time participants had reached their third year of study, 85 % of participants had worked in an AMU, 32 % had worked in an FMU, and 100 % had worked in an OLU.

Most students had witnessed IA in clinical practice (Fig. 3) (Year One = 74.6 %, Year Two = 93.8 % and Year Three = 94.4 %).

Knowledge

Most participants could identify recommended devices for IA, the correct frequency and duration of IA in established labour and the fetal heart qualities that IA can detect (Fig. 4). Almost half of the participants (46.5 %, $n = 141$) indicated fetal heart variability could be detected

Characteristics of Survey Participants (N=303)	n (%)
Country of Approved Educational Institution (AEI)	
England	205 (67.7)
Wales	88 (29)
Scotland	8 (2.6)
N.Ireland	2 (0.7)
Point of training	
Year 1	61 (20)
Year 2	117 (38.6)
Year 3	125 (41.3)
Year 4	0 (0)
Type of course	
3-year	293 (96.7)
4-year	8 (2.6)
18-month (post-registration)*	2 (0.7)

Fig. 1. Characteristics of survey participants
*Some AEIs in the UK offer an 18-month course for nurse registrants to gain a qualification leading to registered midwife status.

Clinical Experience (Where & When)	n (%)
Type of placement experienced	
OLU	266 (87.8)*
AMU	207 (68.3)*
FMU	72 (23.8)*
Time since last clinical placement	
Currently undertaking a placement	67 (22)
Less than a month ago	57 (18.8)
1-2 months	46 (15.2)
2-3 months	43 (14.2)
3-6 months	30 (9.9)
Over six months	35 (11.6)
Never	25 (8.3)

Fig. 2. Student midwives clinical placement and associated timeframe
* Totals do not equate to 100 % due to multiple valid options for answers.

through IA. Most participants demonstrated the application of IA knowledge to clinical practice, selecting actions recommended by NICE (2022) in response to a fetal bradycardia auscultated in the second stage of labour. A high proportion of participants indicated that they should review the whole clinical picture (90.4 %, $n = 274$), change maternal position (88.8 %, $n = 269$), and monitor maternal vital signs (63.7 %, $n = 193$). Fewer participants indicated that they would increase the frequency of auscultation; 65 % ($n = 197$) and 53.1 % ($n = 161$) would ask for help. A third of participants (31.4 %, $n = 95$) said they would immediately change to electronic fetal monitoring.
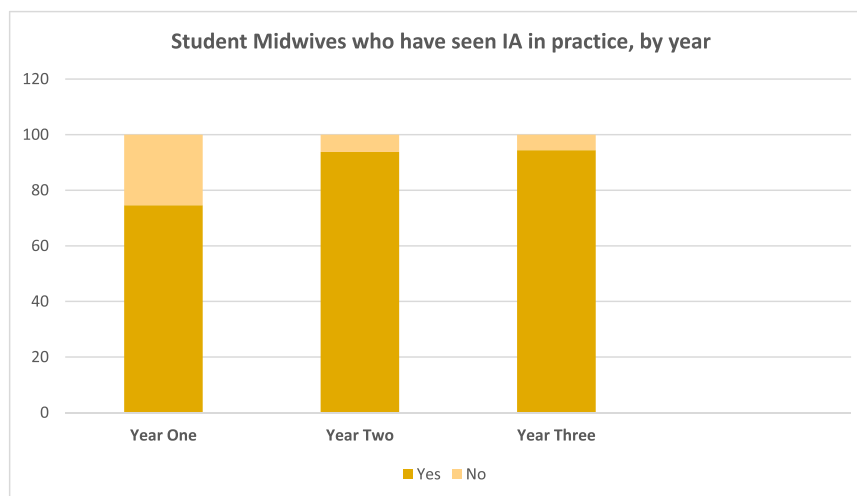
Fig. 3. Percentage of student midwives who have witnessed IA in practice by year of study.

Confidence

The majority of participants reported being either very confident (43.7 %, $n = 129$) or extremely confident (41 %, $n = 121$) in their ability to perform IA under direct supervision (Fig. 5), with confidence increasing with the year of study χ^2 (df=8) $= 77.44$, $p = < 0.001$.

Among participants who had witnessed IA in clinical practice, 88.8 % were confident in their ability to perform IA, compared to 8.2 % of participants who had not witnessed IA.

When identifying a normal fetal heart rate pattern (Fig. 6), most participants described themselves as very confident (48.1 %, $n = 142/303$), with confidence increasing as participants progressed with their studies χ^2 (df=8) $= 68.20$, $p = < 0.001$.

Confidence in detecting an abnormal fetal heart pattern was less apparent (Fig. 7), with most participants identifying themselves as somewhat confident (46.4 %, $n = 137$), with an association between confidence in detecting an abnormal fetal heart pattern and year of study χ^2 (df=8) $= 37.67$, $p = < 0.001$.

Experience

Participants noted that they listened to the fetal heart after a contraction in labour (44 %, $n = 121/275$), but marginally more stated that this was midwives' usual practice (45.5 %, $n = 125/275$) (Fig. 8). When asked how frequently midwives performed IA in the first stage of labour, more than half stated that midwives always auscultated every 15 min (57.9 %, $n = 158/273$), whilst 37 % ($n = 101/273$) of participants stated that this was the usual practice. Similarly, participants were asked if midwives undertook auscultation every 5 min in the second stage of labour; they reported that midwives always (40.8 %, $n = 111/268$) or usually (48.9 %, $n = 133/268$) did this.

Participants reported that midwives used various methods to calculate a baseline fetal heart rate during IA (Fig. 9). These included auscultation for one continuous minute (79.9 %, $n = 242$), auscultation for 30 s multiplied by two (47.5 %, $n = 144$) and auscultation for 15 s multiplied by four (27 %, $n = 84$). A technique of combining the rate heard over consecutive four or more 15 s intervals to calculate a fetal heart rate was the least witnessed in practice (17.2 %, $n = 52$).

Reflexive thematic analysis of free-text responses

Three key themes were identified within the 109 free-text comments: 'confidence in and with IA', 'women's choices, – finding comfort' and 'midwives' work - it can be difficult'. The theme of confidence was further divided into two sub-themes: 'culture – continuous monitoring is king' and

'opportunity – everyone is labelled high-risk'. The patterning within these sub-themes showed participants' belief that their IA confidence was mediated by midwives' perception of IA and the opportunity to practice this mode of fetal monitoring.

Confidence in, and with IA

Confidence was commonly mentioned within the free-text. Comments about the participant's ability to undertake IA were considered 'confidence with' IA, whereas comments about IA's efficacy were considered 'confidence in IA'.

Examples of a lack of confidence with IA abilities were seen in some participants in the free-text contributions.

"I do not feel confident in my skills" (32E, Year 3)

"It takes skill to find the fetal heart…and it's something I just don't have confidence or experience in" (68E, Year 3).

The language participants used suggested their lack of confidence was causing them to worry about their practice:

"I do not feel confident in my skills and feel scared that when qualified I will attend a birth where IA is expected" (47S, Year 3 student).

"I qualify this year and feel that I would not be confident enough [to use IA during labour] (04E, Year 3)".

Some participants expressed that the midwives they worked with were confident in their practice:

"I think midwives feel very confident performing IA" (75E, Year 3).

However, others cast doubts about this:

"I don't think midwives are confident enough to use IA" (13 W, Year 1).

"Midwives are less confident with IA [compared to EFM]" (89E, Year 3).

Furthermore, when midwives were not confident with IA, this impacted participant confidence and competence:

"I have only seen a pinnard [sic] used in clinical practice once, yet it is a skills [sic] students are required to be proficient in. I have found it a hard skill to develop because most midwives no longer have the skill themselves and aren't able to offer any support/advice" (54 W, Year 2).

Participants suggested that the place of work impacted a midwife's confidence and competence with IA. They remarked how staff working in midwifery-led settings were more confident with IA:

Knowledge	n (%)
IA equipment	
Pinard stethoscope	214 (70.6)*
Doppler ultrasound	295 (97.4)*
Fetoscope	21 (6.9)*
CTG Transducer	60 (19.8)*
IA procedure – correct answer provided	
IA started at the end of a palpated contraction	276 (92.3)*
IA interval (1st stage)	289 (95.7)*
IA interval (2nd stage)	273 (90.4)*
Fetal heart qualities audible through IA	
Baseline heart rate	249 (82.2)*
Accelerations	285 (94.1)*
Decelerations	285 (94.1)*
Variability	141 (46.5)*
Actions proposed in the event of a bradycardia in the second stage of labour	
Review the whole clinical picture	274 (90.4)*
Change maternal position	269 (88.8)*
Check maternal vital signs	193 (63.7)*
Increase frequency of IA.	197 (65)*
Call for help	161 (53.1)*
Change to electronic fetal monitoring	95 (31.4)*

Fig. 4. Student midwives knowledge of how to undertake IA
* Totals do not equate to 100 % due to multiple valid options for answers.

"Confidence seems to depend on which clinical area they [the midwife] have been working on for the longest time. I find midwives are very confident if they have worked on MLU's because IA is used more commonly" (44 W, Year 2).

"Community midwives, who deal with more low-risk women, are seemingly more confident with IA" (11E, Year 3).

Although EFM was not the focus of the survey, many responses referred to it, explaining how midwives in obstetric-led birth areas were not confident in IA and felt more comfortable with EFM:

"Labour ward [sic] are more confident and feel more reassured using CTG" (86 W, Year 2).

"I think the midwives that predominantly work on the OU, although completely competent with IA, feel more confident with CTG monitoring" (58E, Year 3).

Seemingly, participants thought that when midwives habitually used a specific mode of intrapartum fetal monitoring, they became more confident in the efficacy of that intervention and in their abilities to use it.

Sub-theme: culture - continuous monitoring is king

A distinct facet of the confidence theme was how some participants and the midwives they worked alongside perceived EFM as safer and more reassuring than IA:

"I think midwives feel happier and feel more confident using EFM" (51E, Year 2).

"I have seen midwives say that they feel more reassured by the use of electronic fetal monitoring" (39E, Year 2).

Participants felt that some midwives were not confident in the usefulness of IA and its ability to detect fetal compromise. The terrain for this lack of confidence was propagated from the view that childbirth was risky, and midwives practised under the threat of litigation. Participants suggested that EFM, with its ability to produce a fetal heart pattern that
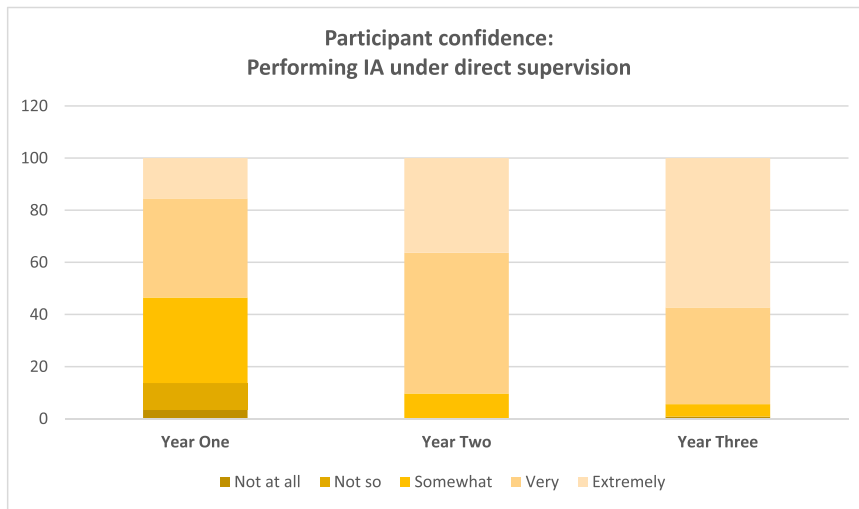
Fig. 5. Student midwives self-assessed confidence in performing IA under direct supervision.
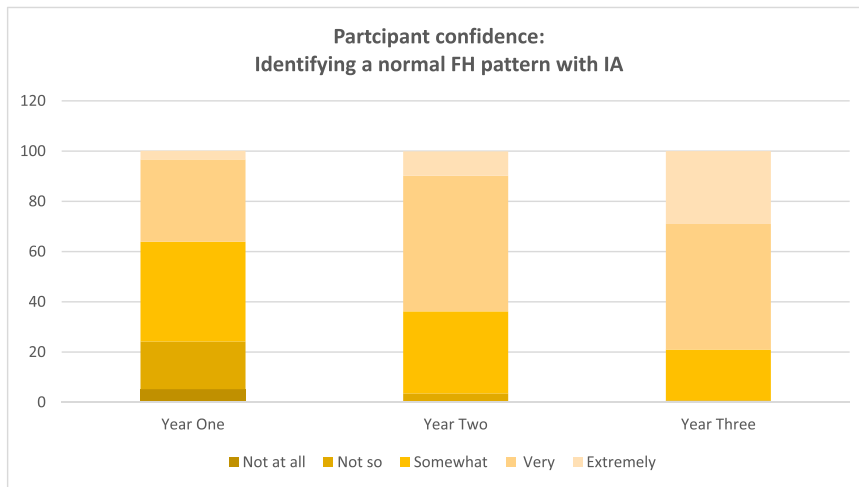

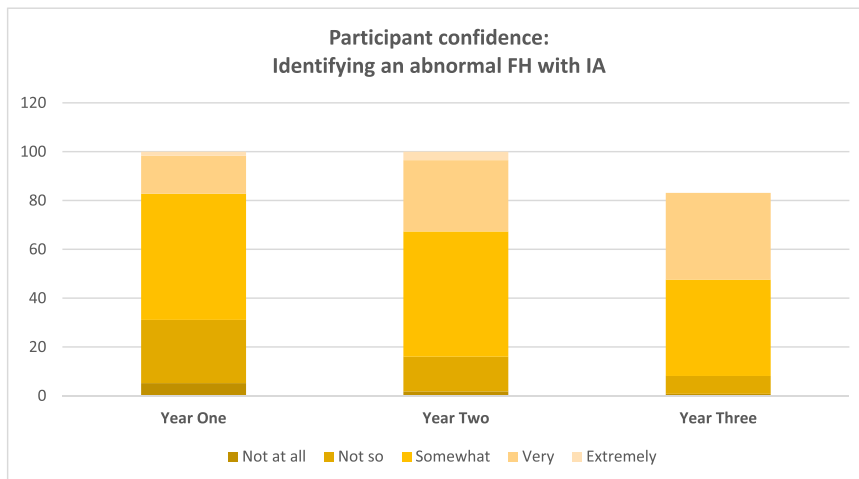**Fig. 6.** Student midwives self-assessed confidence in identifying a normal fetal heart pattern.

Fig. 7. Student midwives self-assessed confidence in identifying an abnormal fetal heart pattern.

Do MW listen to the FH immediately after a contraction?	n (%)	Do MW listen to the FH every 15mins in the 1st stage of labour?	n (%)	Do MW listen to the FH every 5mins in the 2nd stage of labour?	n (%)
Always	121 (44)	Always	158 (57.9)	Always	111 (41.4)
Usually	125 (45.4)	Usually	101 (37)	Usually	133 (49.7)
Sometimes	28 (10.2)	Sometimes	11 (4)	Sometimes	22 (8.2)
Rarely	1 (0.4)	Rarely	3 (1.1)	Rarely	2 (0.7)
Never	0 (0)	Never	0 (0)	Never	0 (0)
Total	275 (100)	Total	273 (100)	Total	268 (100)

Fig. 8. Student midwife feedback on IA practices witnessed in clinical practice.

IA counting techniques witnessed by survey participants

■ 60 secs   ■ 30 secs x2   ■ 15 secs x4   ■ 15 sec intervals
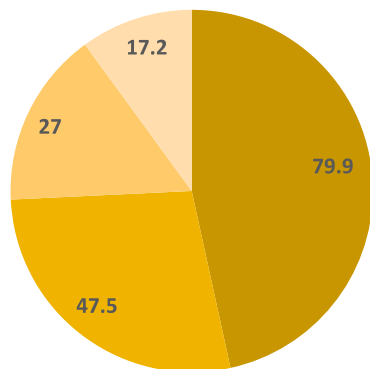
Fig. 9. Types of counting techniques witnessed by student midwives in clinical practice
* NB. This was a multiple-choice question. Participants were able to signify all counting techniques witnessed; therefore, totals do not equate to 100 %.

can be seen and scrutinised by other members of the multidisciplinary team, offered a degree of reassurance to midwives:

"I have heard many midwives say they feel safer when women have continuous electronic fetal monitoring" (81 W, Year 2).

"I believe fear of litigation and preventing unnecessary harm can prevent midwives from having the confidence in their [IA] practice" (50E, Year 3).

Preferences for EFM over IA appeared to extend beyond midwives, with participants believing EFM was more efficacious than IA. For example:

"Continuous monitoring is king" (15E, Year 2).

"[there is] reliability in technology" (91E, Year 1).

"Documented safety of CTG, on paper, everyone can review it, not just the hearing of one midwife" (27E, Year 3).

Sub-theme: opportunity – everyone is labelled high-risk

Participants indicated that many women they cared for were deemed 'high-risk' and, consequently, were advised to have continuous EFM during labour. This trend was reflected within this sub-theme and how participants felt less likely to see IA in practice:

"In my whole time being a student midwife, I have only looked after maybe 1 or 2 women who have had IA. All the other women I have cared for have needed CTG monitoring, whether that is due to needing stronger pain relief, e.g. *epidural or needing high-risk care"* (67E, Year 3).

While others noted:

"In my experience, IA is rare, it is mostly obstetric-led CEFM which makes IA daunting to me" (50NI, Year 3).

"I'm in my second year and only seen it used once. Makes me sad and worried I won't know how to care for someone on an MLU" (08 W, Year 2).

Survey data demonstrated that participants were able to witness IA and, in many cases, practice this mode of fetal monitoring. A lack of opportunity to practice IA impacts students' ability to master this skill. This was further explained by one participant, who noted:

"I did it a lot in my 1st year as I was on an alongside MLU. I loved it. However, since then, I have not had many midwife led women at all, and therefore when it came to doing IA again on one women [sic], I almost forgot how often you were meant to listen in" (47E, Year 3).

Recognising the need to review each woman for complexity to provide appropriate labour care, including fetal monitoring methods, is an essential skill for students to develop. However, some survey participants commented on how high-risk care principles were commonly applied to women at low risk of developing intrapartum fetal compromise. They noted:

"[There seems to be] failure to re-assess women on admission to the labour suite to see if they could be suitable for IA rather than CTG" (37E, Year 3).

"Obstetric-led units use CTG's almost exclusively, even when not always necessary/appropriate…rarely do they promote the use of IA even when there aren't intrapartum risk factors" (10E, Year 3).

These comments suggested that midwives gave primacy to the fetal monitoring norms within the birth environment over evidence-based

practice.

Women's choices – finding comfort

Participants were not directly asked about women's choice of fetal monitoring but offered thoughts on this subject, suggesting that some women chose IA, as it is known to result in fewer intrapartum interventions:

"Some mothers prefer IA [to EFM] as there is less interference" (165E, Year 1).

This belief was often associated with the thought that continuous EFM was a barrier to maternal mobility in labour, but IA was not. For example:

"It [IA] allows mothers to mobilise freely" (732E, Year 2)

"I find IA more appropriate for women as they are able to be more mobile and would be able to birth in a pool for example" (123E, Year 2).

Conversely, others indicated that women actively chose EFM as they believed there was a degree of reliability associated with an ongoing electronic recording of their baby's fetal heart pattern:

"Some [women] find continuous monitoring reassuring" (160E, Year 3)

"Women are finding comfort in monitoring fetal well-being throughout " (140E, Year 3).

There was also a reported third way that women make fetal monitoring choices, with intersectional comments that saw the value of both IA and EFM dependent upon the context of birth:

"Some women state in their birth preferences that they want IA and minimal intervention/monitoring unless [there are] signs of compromise" (160E, Year 3).

Midwives' work – it can be difficult

Theme three focused on the impact of IA on midwives' work. It was suggested that IA increased the workload of midwives, impacting its use:

"[The] use of IA depends on the midwife; some do not like it as they perceive it as a higher workload" (082E, Year 3).

Participants referred to how IA required the midwife to auscultate and assess the fetal heart pattern frequently and how this is difficult to achieve with the increasing demands of advancing labour. Furthermore, undertaking the number and complexity of tasks required from a midwife during labour was thought not to be achievable, resulting in some auscultations being omitted:

"a lot of other responsibilities to be undertaken (e.g., obs, writing notes) so some auscultations may be missed" (162 W, Year 2).

"It can be difficult towards to the end of the second stage and imminent delivery to listen to the fetal heart and be hands-on with delivery. Five minutes passes very quickly in those moments and can be missed" (124E, Year 2).

Another participant highlighted that IA could be technically challenging:

"[IA] is seen as more difficult compared with continuous monitoring, as due to circumstances, i.e., very regular contractions, it can be hard to listen in for a full minute, due to maternal position its more difficult to hear FH" (08 W, Year 2).

However, they also offered an additional reason for this, noting:

"and it means that you have to be constantly in the room whereas CTG [sic] you can see on a screen outside the room". (77E, Year 3).

This response suggested that caring for women outside the birth room at a central telemetry station benefited the midwife.

Discussion

The cross-sectional survey offers insight into UK student midwives' knowledge, confidence and experiences of IA. Perspectives from participants studying in all parts of the UK, undertaking a range of undergraduate programmes, were gathered. Participants studying in England and those undertaking a three-year undergraduate programme were most represented, emanating from factors such as population spread and NHS commissioning of undergraduate places. Participants had experienced a range of clinical placements, mainly within six months of survey response, reducing the risk of recall bias. Quantitative and qualitative findings concerning participant knowledge, confidence and experience were drawn together to look for similarities and differences and compared to existing knowledge to interpret the results.

Participant knowledge

The descriptive data demonstrated that overall, respondent knowledge was reasonable and was in keeping with NICE (2017) intrapartum guidance. Most participants could successfully describe how to perform IA, i.e., what equipment they would use, and the frequency and timings employed within this intervention. This finding suggests a level of engagement with IA theory before or during their engagement with the cross-sectional survey. Most could recount acoustic qualities of normal fetal heart patterns, although almost half of the participants were confused about fetal variability, erroneously believing it could be detected with IA. Given the number of respondents who subscribed to this belief, discussion about what fetal heart qualities both EFM and IA can detect should be included in student learning. This error should also be highlighted to practice educators, as qualified staff may hold these beliefs.

Participant confidence

Qualitative data demonstrated that a significant number of participants had witnessed IA in practice, and generally, their confidence in their ability to perform this mode of fetal monitoring grew year after year. However, this was not the case for all participants. Data relating to survey free-text depicted a lack of confidence for some, attributable to a lack of opportunity to witness and practice IA. Learner anxiety and lack of self-confidence are expected and part of their journey from novice to expert (Benner, 1984). Undergraduates commonly report increased stress levels when developing psychomotor skills in the clinical environment (Pike and O'Donnell, 2010). However, in excess, these feelings can be barriers to learning (Norman and Hyland, 2003) and are linked to difficulties in developing clinical competence (Bäck et al., 2017).

Good clinical placements and supervising midwives are essential to developing student competence, confidence, and self-esteem (Bäck and Karlstöm, 2020). Participants noted how midwives who regularly worked in community or midwifery-led birth areas were more likely to be confident in IA and support them to gain IA-related skills. In comparison, the midwives who worked in obstetric-led settings were less likely to be confident in their IA abilities and confident in IA as an efficacious mode of intrapartum fetal monitoring. The interpretation of fetal heart patterns is a complex activity that requires ongoing exposure to monitoring theory and practice. To date, no studies have been performed to measure how often clinicians need to exercise their intrapartum fetal monitoring skills to maintain confidence and proficiency. However, evidence suggests clinicians can experience 'skill decay' if they do not practice tasks regularly (Vlasblom et al., 2020). This phenomenon is more pronounced if the skill is complex (Boet et al., 2011; Cahillane and Morin, 2012; Vlasblom et al., 2020). If midwives are unable or unwilling to practice their IA-related skills, their knowledge,

skills and confidence will diminish. This will impact student midwives' teaching and learning in clinical practice.

Participants also felt that the lack of opportunity to practice IA was also attributable to the number of women in clinical practice who were deemed to be at high risk of intrapartum fetal compromise. In their experience, EFM was sometimes used without clinical indication or maternal choice. Past studies have demonstrated that women are either not offered choices in the method of fetal monitoring during labour (Hindley et al., 2008; Crawford et al., 2017) or are presented with options in a pre-determined or biased manner (Small et al., 2022).

Participant experience

Participants suggested that midwives' IA practice was mostly in keeping with NICE (2022) guidance, although some may have witnessed midwives auscultating more or less frequently than recommended by NICE (2022). Narrative within the survey free-text indicated that when participants had witnessed missed auscultations, this was more likely during the second stage of labour when demands on both women and midwives increased. These comments correspond with existing literature on the challenges of IA (Maude et al., 2014; Patey et al., 2017; Ayabare et al., 2020) and suggest the need for research into the support required by midwives during intrapartum care.

Participants reported working with midwives who doubted the efficacy of IA and its ability to detect intrapartum fetal compromise, preferring EFM instead. Doubt about the efficacy of IA appeared to coexist with a suggestion that birth was inherently 'risky'. This perception is not unfounded. Scammell (2016) suggested that midwives practice pluralistically, where labour and birth are natural life events but practised from a risk perspective. Moreover, this may be causing some midwives to work in fear (Coxon et al., 2014; Toohill et al., 2019). This position is not only concerning for midwives but also for the students who work alongside them, as when learners' experience is based on fear, cognition is impaired (Goleman, 2004), impacting memory and learning processes (Bigdeli, 2010).

General aspects of care of women during labour were further mentioned. One isolated but noticeable excerpt in the free text inferred that EFM with a centralised monitoring station was more beneficial than IA, allowing the midwife to leave the birth room and monitor the woman from outside. Midwives do legitimately leave the birth room periodically to obtain assistance, equipment, or privacy for the woman and her family. However, when midwives leave the birth room without explanation or for long periods, it can impact safety (Nove et al., 2021) and bring about feelings of abandonment and neglect for women (Malatij and Madiba, 2020; Harrison et al., 2021). All women should experience a midwife's physical or, at least, their immediate available presence (Tumblin and Simpkin, 2001; Borelli et al., 2016).

The Ockenden Report (2022) recommended that centralised electronic fetal monitoring systems be mandatory in all UK obstetric units. However, care must be taken that this does not impact the quality of intrapartum care as it may have unintended consequences, including changing clinicians' behaviour (Small et al., 2021). If an increasing number of women become cared for through a central telemetry system, this is concerning for women and student midwives. As witnessing midwives who practise woman-focused care expands the skills and proficiencies of a student midwife (Jordan and Farley, 2008). Student midwives are known to emulate the practices of those they work with (Bluff and Holloway, 2008). Therefore, good role models are fundamental to developing student self-efficacy and confidence (Thunes and Sekse, 2015) and how they practice in the future (Nieuwenhuije et al., 2020; Kirkup, 2022).

Strengths and limitations

This study offers insight into the under-researched field of IA from the perspective of student midwives. The survey offered insight into student knowledge, confidence and experience and a better understanding of the barriers and facilitators that student midwives may experience in acquiring IA-related skills in clinical practice. Analysis of open-text responses to the survey formed a significant part of reporting the study results. This reflected the volume of text provided and the depth of feeling expressed by study participants.

Although 303 student midwives from all parts of the UK participated in this survey, it is recognised that the responses may not represent all student midwives' thoughts and IA experiences. Demographic data relating to student midwives are not held by the NMC or UK commissioners of training places for student midwives; therefore, it could not be determined if the characteristics of the students who participated differed from those who did. Not all participants provided free text responses; therefore, participants may have had experiences or opinions about IA that they did not share. Furthermore, the cross-sectional survey is limited by its ability only to measure a phenomenon of interest at a single point in time and its ability to demonstrate cause and effect. However, to offer equipoise and increase validity, study findings were explored and affiliated with existing research.

Implications for future practice

Student midwives must understand the physiology of fetal heart patterns, how to interpret these in a clinical context and what to do if a deviation from the norm is detected. Theoretical teaching must acknowledge and recommend evidence-based practice related to this field, including the strengths and weaknesses of all modes of intrapartum fetal monitoring and the need for women to make informed choices. The findings of this cross-sectional survey suggest that teaching and learning about IA should also highlight to students how and why they may see variations in clinical practice.

IA is a complex intervention requiring students to attain a unique range of cognitive, psychomotor and affective skills taught between academic and clinical settings. To facilitate this, AEI's must place their undergraduates in birth environments that use IA regularly. Equally, maternity services must ensure their midwives can support student midwives in developing IA confidence and competence.

Suggestions for future research

Research is required to design and evaluate training intrapartum fetal monitoring methods for student midwives. This needs to include the physiology of fetal heart rate patterns, an understanding of evidence-based practice and how to support women in making informed choices about fetal monitoring. Given the distinct challenges that participants identified for midwives when using IA, further study should be undertaken into midwives' experiences with this mode of fetal monitoring (Blix et al., 2019).

Conclusion

This study offers insight into UK student midwives' theoretical knowledge of IA, their confidence with this essential clinical skill, and their experience of IA within clinical practice. Study findings suggested a satisfactory level of IA knowledge in UK student midwives. However, measures of confidence demonstrated mixed findings. The study demonstrated some optimistic narratives, noting how midwives who regularly worked in midwifery settings were proponents for IA and supported student midwives in developing their IA-related skills. In contrast, it also found that issues such as the reduced number of women suitable for IA, organisational culture and midwives' beliefs about the ease and efficacy of IA, and midwives' preference for EFM and variation in clinical practice negatively impacted participant confidence in their ability to practice IA effectively. NMC-approved AEI's and affiliated areas of clinical practice should be cognisant of these barriers and facilitators to using IA if students are to meet fetal monitoring

proficiencies befitting registered midwife status.

CRediT authorship contribution statement

K. Phillips: Conceptualization, Methodology, Formal analysis, Data curation, Writing – original draft, Writing – review & editing. **J. Sanders:** Conceptualization, Methodology, Formal analysis, Writing – review & editing, Supervision. **L.E. Warren:** Conceptualization, Methodology, Formal analysis, Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.midw.2024.103952.

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