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# Do women have a choice when it comes to fetal monitoring? Perceptions of information provided and choice of fetal monitoring in Australia: A national survey

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ABSTRACT

*Intro:* In Australia, little research has examined how women and people participate in decision-making about types of fetal monitoring, or their perceptions of information provided by caregivers.
*Methods:* A national cross-sectional survey, the 'Women's experiences Of Monitoring Baby' (WOMB) Study, explored women's experiences of intrapartum fetal monitoring. This study reports on selected results.
*Results:* There were 861 responses. Of respondents, 20 % reported receiving enough information about types of fetal monitoring from care providers and childbirth education, 35 % recalled being asked for consent, and 34 % were unaware they had a choice in monitoring. Most women (86 %) obtained information via 'other' sources or own reading, and where monitoring was discussed, it was most likely a 'brief discussion' with a midwife (43 %). Women who were monitored via wired CTG (35 %) were more likely to report facing barriers to choosing their preferred monitoring type, ($p<0.001$). Wired CTG was significantly associated with hospital type and primiparity and 70 % indicated they would not choose it again ($p<0.001$).
*Conclusion:* Women did not know they had a choice in the type of intrapartum monitoring received, and felt they had insufficient information to make informed decisions. While monitoring via intermittent doppler and wireless CTG was preferred, women experienced barriers to receiving these, especially in public hospitals in rural/regional areas and private metropolitan hospitals. Antenatal models of care and childbirth education are underutilised avenues for providing information however, it is incumbent on maternity systems to provide adequate information resources, access to equipment and appropriate models of woman-centred and humane care.

*Abbreviations:* CEFM, Continuous electronic fetal monitoring; EFM, Electronic fetal monitoring; CTG, Cardiotocography; FSE, Fetal scalp electrode; NIFECG, Non-invasive fetal electrocardiogram.

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## Inclusivity statement

We have chosen to use the word 'woman' to reflect female physiology in childbirth. However, we respect gender diversity and acknowledge that not all people who are pregnant or giving birth identify as women.

| | |
|---|---|
| Problem or Issue | Little research has examined women's experiences of fetal monitoring in terms of their participation in decision-making, and how and where information is provided to them about the evidence-based risks and benefits of different types of monitoring and reasons for monitoring. |
| What is already known | The form of monitoring technology a woman receives during labour can have an impact on both physiological and psychological outcomes. |
| What this paper adds | This paper provides insights into women's experience of informed consent, comfort and the perceived barriers to choosing a preferred monitoring type, indicating that place of birth, parity and care provider type are significant factors in monitoring provision. |

## Background

During childbirth, fetal monitoring is routinely used on an intermittent or continuous basis to monitor the wellbeing of the fetus. Intermittent monitoring with handheld devices such as Pinard fetoscope or Doppler is indicated for women and people whose pregnancy is considered low risk, and for whom labour is progressing normally [1,3]. Women with a complex pregnancy are routinely advised to be continuously monitored during labour [4,7,24,29], although the evidence for this is controversial [2,32,34]. The controversy is situated in several factors, including the lack of clinical trial evidence to support the use of electronic CTG, the significant differences observed in interrater reliability, the lack of reduction in clinically important outcomes, such as caesarean section, and the significant variation in guidelines internationally [19]. Options for continuous electronic fetal monitoring (CEFM) include cardiotocography (CTG) being conducted via wired, or wireless transducers, fetal scalp electrode (FSE), where a coiled wire is inserted into the fetal scalp during labour via the vagina, or non-invasive fetal electrocardiogram (NIFECG) (adhesive, beltless, wireless), which has recently become available in Australia [12].

More than half of women giving birth in Australia each year experience continuous CTG monitoring [1,24] for indications such as multiple pregnancy, previous caesarean section, epidural analgesia, induction/augmentation of labour, delayed progress in labour, suspected fetal compromise and many others (NSW Health, 2018). Options for monitoring technologies may be dependent on factors such as the clinical circumstances of the woman's pregnancy and clinician decision making, but may also be impacted by availability within the hospital [12].

The form of monitoring technology a woman receives during labour can have an impact on both physiological and psychological outcomes. Studies demonstrate that being mobile and active during labour can result in shorter labours, fewer epidurals, and reduced likelihood of caesarean sections, without increasing negative outcomes for mothers and babies [16,27]. Australia currently has a 38 % caesarean section rate [1], far exceeding the World Health Organization's acceptable rate of 10-15 % globally [5], and which has significant short- and long-term impacts upon the health of populations [30]. Therefore, the form of monitoring is an important consideration in terms of mobility and freedom of movement.

The development of wireless CTG monitoring technology (also known as telemetry), to facilitate mobility, has been available for almost 20 years, and while healthcare providers surveyed in public and private hospitals in Australia and New Zealand, perceive wireless monitoring to positively influence women's freedom of movement and sense of choice and control in labour, uptake is not universal [12].

While continuous monitoring in labour has become somewhat ubiquitous, despite a lack of evidence of benefit [32], how women experience these different forms of monitoring is not well understood. To date, very little research has examined women's experiences of fetal monitoring in terms of their participation in decision-making, and how and where information is provided to them about the evidence-based risks and benefits of different types of monitoring and reasons for monitoring. Additionally, there is little literature pertaining to whether this information is congruent with women's experiences and preferences in the intrapartum period, and what information would assist women in understanding their options for monitoring.

Therefore, to address this gap, this study reports on selected results from the 'Women's experiences Of Monitoring Baby' (WOMB) Study, a national survey of women's experiences of intrapartum fetal monitoring. This paper presents an analysis of responses received from women / birthing people about their experiences of fetal monitoring. In particular, this section of the WOMB Study explored how and what information was provided to women in the antenatal period, and by whom; and whether there were perceived barriers for choosing their preferred monitoring type. Responses were analysed according to hospital and care provider type.

## Aims

### *Aims and objectives*

This study is one of three papers presenting an analysis of responses to a national survey asking women about their experiences of fetal monitoring during labour. This paper presents quantitative findings related to women's sources of information about fetal monitoring in the antenatal period, as well as their perception of choice, decision making, comfort and the impact of monitoring, for themselves and their babies in the intrapartum period.

Therefore, the aims of this research are to:

1. Identify pregnant women's sources of information regarding intrapartum fetal monitoring, including Childbirth and Parenting Education (CBPE), care providers and online sources.
2. Understand if women felt they received enough information about fetal monitoring, and from which sources.
3. Understand if women felt they had choice in the type of monitoring they received, and if they perceived barriers to choosing the type of intrapartum fetal monitoring technology they wanted.
4. Determine if women would choose the same intrapartum fetal monitoring type again.
5. Understand women's experiences of comfort according to type of monitoring received.

## Methods

### *Study design*

The WOMB study was a national cross-sectional survey exploring women's experience of fetal monitoring administered over a one-month period from 30th May to 30th June 2022. Both quantitative and qualitative data were collected via an online survey developed by the authors, and pilot tested with a group of 10 consumers. The survey was offered as an online survey link via Qualtrics® software.

This is one of two papers which address the quantitative responses to the survey. Other selected quantitative outcomes [17], and qualitative results [10] have been reported elsewhere.

### *Survey design*

#### *Consumer consultation*

This national survey was designed to seek consumer input to inform

planned future research implementation. We formed an advisory group for the purposes of guiding the study questions, the translation of the generated evidence into policies and guidelines, and to inform the future clinical trials investigating optimal application of fetal monitoring. The advisory group played an active role during the implementation of this study, including sub-studies, during regular steering group meetings.

*Survey structure*

The survey was designed by the research team based on the expertise of team members, which includes midwifery academics, a maternal health epidemiologist and childbirth education researchers. Pilot testing with the consumers/stakeholders prior to commencement of the project, resulted in minor changes, which were mainly editorial in nature. The survey collected information about women's demographic data, type of hospital attended, childbirth education participation, sources of information about monitoring, level of information regarding monitoring as discussed by care providers, type of monitoring and women's experience of monitoring in labour, using a combination of multiple choice, forced choice, Likert scale and free text responses for further clarification where required.

*Recruitment*

The online survey was distributed widely across Australia on multiple parenting websites, through social media and through several paid Facebook advertisements via the 'Mum's Network', as well as the authors' professional networks. Women were eligible to participate if they were able to read English, were over 18 years of age, had given birth in the previous five years to one or more babies in Australia, and they had some form of monitoring during their labour. This included the time-period where Covid-19 public health restrictions were in place for maternity hospitals nationally, therefore some of the participants answers pertain to care provided under Covid restrictions.

*Data analysis*

Valid responses were defined as having a survey completion rate of more than 50 % of the total survey. Analysis of quantitative data was completed using Statistical Package for the Social Sciences (SPSS) version 23. Survey data were initially cleaned, de-identified and coded in Excel prior to uploading to SPSS. Descriptive statistics performed included counts and percentages. Categorical analysis was performed using Chi-squared tests, and continuous variables used student t-tests and analysis of variance (ANOVA) tests. Where the data were non-parametric, a Kruscall–Wallis test was applied. Response rates varied between questions, and missing data is accounted for in the analysis.

The demographic details of the participants who completed the WOMB national survey in 2022 included age, education level, family income, relationship status, country of birth, Indigenous status, parity, birth location (State/Territory and birth setting) and attendance at childbirth and parenting education (CBPE).

*Categories for monitoring type*

To analyse association between type of monitoring and outcomes of interest, we categorised monitoring according to the main type experienced during labour (excluding the admission trace). Allocation was to one of the following;

1. Handheld monitoring (pinards and doppler),
2. Wireless CTG monitoring (telemetry with belts, no wires),
3. Wired CTG monitoring (transducers with belts and wires),
4. NIFECG/adhesive electrode monitoring (beltless and wireless),
5. Fetal scalp electrodes (attached directly to baby's scalp), or
6. Multiple monitoring, if the respondent indicated that they had more than one form of primary monitoring type other than an admission trace.

## Results

There were 861 valid respondents to this survey, with 798 providing information on monitoring type (see Table 1). Respondents had an average age of 33 years (±5.2 years), with the majority being Australian born (88.5 %), primiparous (65 %), had tertiary level education (74.2 %), and were married or in a de-facto relationship (95.3 %). There were 28 (3.3 %) respondents who identified as Aboriginal or Torres Strait Islander which is which is slightly less than the national average of 5.1 % of childbearing women [1]. In this sample, the most common birthplace settings were a local hospital that was rural or remote (31.3 %) or a local metropolitan hospital (25.6 %).

*Sources of information and discussion about fetal monitoring - CBPE*

Survey participants were asked about their sources of information regarding fetal monitoring. We asked whether information about fetal monitoring was provided at CBPE classes, to which 841 women responded. Of these, 355 (42.2 %) reported that they received some information about fetal monitoring from CBPE classes.

**Table 1**
Demographic table of participants.

| Characteristics | n = 861 (missing = 30 (3.4 %)) | (%) |
|---|---|---|
| **Age** | Mean = 33.0 y (±5.2) | |
| **Education**: (n = 861) | | |
| <Yr 12 equiv | 14 | 1.6 |
| Yr12 equiv | 55 | 6.4 |
| TAFE | 153 | 17.8 |
| Bachelors | 321 | 37.3 |
| Postgraduate | 318 | 36.9 |
| **Country of birth** | 762 | 88.5 |
| Australia | 86 | 10.0 |
| NZ/UK/USA/Canada/Europe | 13 | 1.5 |
| Asia | | |
| **Identify as Aboriginal or Torres Strait Islander** | 28 | 3.3 |
| Yes | | |
| **Parity** | 560 | 65.0 |
| Primiparous | 298 | 34.6 |
| Multiparous | 3 | 0.4 |
| Missing | | |
| **Birth Location** | 141 | 1.3 |
| Large/Tertiary Hospital | 221 | 25.6 |
| Local Hospital Metropolitan | 87 | 10.1 |
| Private Hospital Metropolitan | 53 | 6.2 |
| Birth Centre Hospital (alongside) | 1 | 0.1 |
| Birth Centre freestanding | 269 | 31.2 |
| Public Hospital Rural Remote | 62 | 7.2 |
| Private Hospital Rural Remote | 27 | 3.1 |
| Missing | | |
| **State** | 268 | 31.1 |
| NSWACT | 102 | 11.8 |
| Victoria | 170 | 19.7 |
| QLD | 165 | 19.2 |
| SA | 31 | 3.6 |
| WA | 51 | 5.9 |
| Tas | 28 | 3.3 |
| NT | 34 | 4.0 |
| Missing | 12 | 1.4 |
| **Relationship status** | 614 | 71.3 |
| Married | 204 | 24.0 |
| De-facto | 15 | 1.7 |
| Separated | 21 | 2.4 |
| Single | 2 | 0.2 |
| Divorced | 5 | 0.5 |
| Other | 0 | 0 |
| Missing | | |
| **Attendance Childbirth Education (CBE)** | 558 | 64.8 |
| Yes | 303 | 35.2 |
| No | | |

*Countries: NZ = New Zealand; UK = United Kingdom; USA = United States of America

However, the majority of those who reported receiving information from CBPE stated that it was through 'other' sources (n=159 (44.8 %)), or via reading or other investigation (n=146 (41.1 %)), rather than from CBPE attendance (Table 2). It is unclear from the responses what the 'other' sources refers to in terms of CBPE, which is a limitation of this study. It potentially refers to other care providers or information from the internet.

*How and with whom monitoring was discussed – care providers*

With regard to women receiving information at antenatal visits, we asked a series of questions, which included.

1. *Did a care provider discuss fetal monitoring with you?*
2. *How was it discussed and by whom?*
3. *Did a care provider indicate there was a health condition present that required monitoring?*
4. *Were you asked for consent for monitoring?*
5. *Did you feel that you received enough information to make a decision about fetal monitoring?*
6. *Was wireless monitoring available at your birth hospital/location?*
7. *Were you offered wireless monitoring?*

Women reported mostly that care providers either did not discuss fetal monitoring with them (36.0 %), or that there was only a brief discussion (31.1 %). Where discussed, it was reported that the information mainly came from a midwife in a brief format (43.4 %). Where continuous fetal monitoring was recommended by a healthcare professional, 37.0 % of respondents were aware of the specific indication or health condition underpinning the recommendation for continuous monitoring (see Table 3).

Regarding obtaining consent, 35.3 % of women reported that they were asked for their consent, 25.6 % reported that they were not asked, and 28.6 % couldn't remember if they were asked or not. Finally, in this cohort, only 20.7 % of women reported feeling that they had enough information about monitoring.

*Wireless monitoring availability and choice*

Women were asked if they were aware of wireless monitoring being available at their place of birth, and if they were offered wireless monitoring in the intrapartum period.

Nearly 42 % (n=360) of women reported that wireless CTG monitoring was available at their place of birth. Around 43 % (n=324) of respondents were either not sure whether it was available or stated that it was not discussed. Only 13.6 % (n=117) of women reported being offered wireless CTG monitoring, 9.9 % (n=84) reported that they asked for wireless CTG, and more than a third of women (291 (33.8 %)) stated that they did not know that they had a choice in the form of monitoring received. For 67 women (7.8 %) wireless monitoring was the only form of monitoring available at their place of birth.

*Information according to monitoring type – analytic statistics*

In this categorical analysis, using an ANOVA test, we examined if women felt they had enough information about the type of fetal monitoring they received in labour, according to each type. There was a significant difference in women's perception of sufficiency of information between groups (monitoring types) ($p<0.001$) (Table 4). Overall, 40.6 % of women felt they had enough information, and 41.6 % felt they did not have enough or wanted a bit more information. When examined in each category using pairwise comparisons, we found that women who reported not having enough information were more likely to have received monitoring via wired CTG (56 %), and those who reported having enough information were more likely to have received monitoring via handheld doppler (67.7 %).

**Table 2**
Information sources for fetal monitoring.

| **Source of information N = 861** | **n=355 n (%)** |
|---|---|
| Hospital class | 13 (3.7) |
| Private class | 25 (7.0) |
| Online class | 12 (3.4) |
| Other info/source | 159 (44.8) |
| Reading/other investigation | 146 (41.1) |
| total | 355 (100) |

**Table 3**
How information was discussed and availability of monitoring.

| **Total sample** | | **TOTAL N= 861** |
|---|---|---|
| **How discussed** | Care provider - No discussion | **N (%)** |
| **n=793** | Care provider - Yes brief | 309 (36.0) |
| **(missing 68)** | Care provider - Yes in detail | 266 (30.9) |
| | Don't remember | 101 (11.7) |
| | Missing | 117 (13.5) |
| | | 68 (7.9) |
| | TOTAL | 861 |
| **Who discussed** | Care provider explained | **N (%)** |
| **n=845** | Midwife explained brief | 128 (14.9) |
| **(missing = 16)** | Midwife explained detail | 374 (43.4) |
| | OB explained brief | 135 (15.7) |
| | OB explained detail | 30 (3.5) |
| | Explained when asked | 31 (3.6) |
| | Can't remember | 98 (11.3) |
| | Missing | 49 (5.7) |
| | | 16 (1.9) |
| **Care provider stated need for monitoring** | Yes, health condition | **N (%)** |
| **n=804** | identified | 315 (37.0) |
| **(missing = 57)** | Yes, nil health condition | 121 (14.1) |
| | No monitoring indicated | 368 (42.7) |
| | Missing | 57 (6.6) |
| **Asked consent** | Yes | **N** |
| **n=770** | No | 304 (35.3) |
| **(missing = 91)** | Can't remember | 220 (25.6) |
| | Missing | 246 (28.6) |
| | | 91 (10.6) |
| **Enough information** | Yes | **N** |
| **n=771** | No | 178 (20.7) |
| **(missing = 90)** | No, but happy to go ahead | 306 (35.5) |
| | Not sure | 68 (7.9) |
| | Missing | 219 (25.4) |
| | | 90 (10.5) |
| **Wireless monitoring available** | Yes | **N (%)** |
| **n=746** | No | 360 (41.8) |
| **(missing = 115)** | Not sure | 62 (7.2) |
| | Not discussed | 145 (16.8) |
| | Missing | 179 (20.8) |
| | | 115 (13.4) |
| **Offered wireless CTG** | Offered wireless CTG | **N (%)** |
| **n=755** | Asked for wireless CTG | 117 (13.6) |
| **(missing = 106)** | Didn't know they had | 84 (9.9) |
| | wireless CTG | 76 (8.8) |
| | Didn't know I had a choice | 291 (33.8) |
| | Only wireless CTG available | 67 (7.8) |
| | No CTG needed | 120 (13.8) |
| | Missing | 106 (12.3) |

*Barriers to choosing monitoring type*

In the survey, the question was asked: *Were there any barriers for you in choosing the type of monitoring you had in your labour?* Using an ANOVA test for differences between categorical groups, we found that overall, there was a significant difference between groups regarding whether they felt there were barriers to them choosing monitoring type (<0.001) (Table 5). In a pairwise comparison, women who were monitored via handheld doppler were more likely to report that there were no barriers

**Table 4**
Enough information provided by monitoring type.

| Monitoring type N = 861 (missing = 63) | ENOUGH INFORMATION ON MONITORING TYPE | | | | TOTAL | $X^2$ p value |
|---|---|---|---|---|---|---|
| | No (%) | A bit, wanted more (%) | Not sure (%) | Yes (%) | N = 798 | |
| Handheld n = 130 | 10 (7.7) | 19 (14.9) | 13 (10) | 88 (67.7) | 130 (16.3) | |
| Wireless n = 163 | 20 (13.2) | 45 (27.6) | 32 (19.6) | 66 (40.5) | 163 (20.4) | |
| Wired n = 281 | 85 (55.9) | 62 (22.1) | 59 (19.5) | 75 (26.7) | 281 (35.2) **P <.001**** | |
| Fetal scalp n = 39 | 11 (28) | 10 (25.6) | 5 (12.8) | 13 (2.6) | 39 (4.9) | |
| NIFECG n = 3 | 0 | 3 (100) | 0 | 0 | 3 (0.4) | |
| Multiple n = 182 | 26 (14.2) | 41 (22.5) | 33 (18) | 82 (45.1) | 182 (22.8) | |
| **Total** | **152 (19.0)** | **180 (22.6)** | **142 (17.8)** | **324 (40.6)** | **798** | |

*NIFECG: Non-invasive fetal electrocardiogram

**Table 5**
– Barriers to choosing monitoring type.

| | No barriers | Yes barriers | Didn't know there was a choice | Total | |
|---|---|---|---|---|---|
| Handheld n = 126 | 76 | 29 | 21 | 126 | p value <0.001 |
| Wireless n = 158 | 49 | 73 | 36 | 158 | |
| Wired 274 | 28 | 166 | 80 | 274 | |
| Fetal scalp n = 34 | 9 | 14 | 11 | 34 | |
| Stick on n = 3 | 0 | 2 | 1 | 3 | |
| Multiple n = 176 | 50 | 73 | 53 | 176 | |
| Total | 212 | 357 | 202 | 771 | |

to choosing the type of monitoring received, and women who were monitored via wired CTG, which was the largest category, were most likely to report 'yes' there were barriers to choosing the type of monitoring they wanted (p<0.001). Of the women who were monitored via wired CTG, 29 % reported not knowing that there was a choice of monitoring type. Women were able to provide text responses to this question, which clarified what the perceived barriers were. They fell broadly into four categories; prioritisation of the data by clinicians, sensing the machine is unreliable, restriction of movement in labour, and the need for choice and control. These results are more fully reported in a separate qualitative analysis [10].

### *Barriers to choosing according to place of birth*

We analysed if there were differences in barriers to choosing monitoring type, according to several factors, using a multi-factorial regression analysis. This included: place of birth; whether the care provider had discussed monitoring; whether it was their first baby; and according to women's level of education. We found that there was no difference in reported barriers to choosing type of monitoring depending on women's level of education (p=0.205), however there were significant differences in women's likelihood of reporting barriers to choosing type of monitoring according to whether the care provider had discussed monitoring (p<0.001), and place of birth (p<0.001). Overall, the majority of women (72.5 %) reported either that there were barriers to choosing monitoring type, or that they didn't know they had a choice (Table 6). Women who were having their first baby, or those attending a public hospital (metropolitan or rural/remote), or a private hospital (metropolitan) were more likely to report barriers to monitoring (p<0.001). Women who had a home birth were least likely to report barriers to choosing monitoring type (Table 6).

**Table 7**
Choose same monitoring again by monitoring type.

| Monitoring type | WOULD YOU CHOOSE SAME MONITORING AGAIN | | | TOTAL | $X^2$ p value |
|---|---|---|---|---|---|
| | Yes (%) | No (%) | Unsure (%) | | |
| Handheld n = 106 | 80 (75.5) | 9 (8.5) | 17 (16.0) | 106 | **p <.001** |
| Wireless n = 139 | 62 (44.6) | 52 (37.4) | 25 (18.0) | 139 | |
| Wired 249 | 33 (13.3) | 172 (69.1) | 44 (7.7) | 249 | |
| Fetal scalp n = 31 | 9 (29.0) | 15 (48.4) | 7 (22.6) | 31 | |
| NIFECG n = 2 | 0 | 2 (100) | 0 | 2 | |
| Multiple n = 154 | 46 (29.9) | 74 (48.1) | 34 (22.1) | 154 | |
| **Total** | **230 (33.7)** | **324 (47.6)** | **127 (18.7)** | **681** | |

**Table 6**
Barriers to choosing monitoring by place of birth.

| Barriers to choosing | Tertiary Public Hospital Metro N (%) | Public Hospital Metro N (%) | Private Hospital Metro N (%) | Private Hospital Rural / remote N (%) | Public Hospital Rural / remote N (%) | Birth Centre setting N (%) | Home birth setting N (%) | TOTAL |
|---|---|---|---|---|---|---|---|---|
| No | 38 (30.0) | 47 (24.3) | 14 (17.5) | 10 (18.5) | 64 (26.2) | 22 (44.9) | 16 (76.2) | 212 (27.5) |
| Yes | 45 (35.4) | 103 (53.4) | 47 (58.8) | 33 (61.1) | 103 (42.2) | 23 (46.9) | 1 (4.8) | 357 (46.3) |
| Didn't know there was a choice | 44 (34.6) | 43 (22.3) | 19 (23.7) | 11 (20.3) | 77 (31.6) | 4 (8.2) | 4 (19.0) | 202 (26.2) |
| **TOTAL** | 127 (16.5) | 193 (25.1) | 80 (10.4) | 54 (7.1) | 244 (31.7) | 49 (6.4) | 21 (2.8) | 771 **P<.001** |

*Comfort with monitoring*

When asked about levels of comfort on a 10-point scale (0 being the least comfortable and 10 being the most), there was a significant difference in reported levels of comfort between monitoring types. As the data were non-parametric a Kruskal-Wallis test of significance was used (see Fig. 1). In a pair-wise comparison of independent samples, monitoring via handheld Doppler was significantly more comfortable than wireless CTG ($p<0.001$), wired CTG ($p<0.001$) and multiple monitoring types ($p<0.001$). Wireless CTG monitoring was significantly more comfortable than wired CTG ($p<0.001$), and wired CTG monitoring reported as the least comfortable type of monitoring.

*Would women choose the same monitoring again?*

When we asked women if they would choose the same monitoring again, women who were monitored via handheld Doppler and wireless CTG monitoring were more likely to say that they would choose the same type again compared to those who would not, and women who had wired CTG monitoring were more likely to report that they would not choose the same monitoring again ($p<.001$).

## Discussion

This study examined women's and birthing people's experiences of fetal monitoring during labour in an Australian national survey. We found that there were significant differences in women's experiences of choice, comfort, decision making and perceived barriers to monitoring according to the type of monitoring received, with wired CTG monitoring being the least comfortable and affording women the least choice and the most barriers. Women's perception of choice and barriers depended on who provided them with information, their place of birth and their parity. Given the ubiquity of monitoring, and the potential impact that commonly occurring monitoring has on women's experience, it is incumbent on maternity care providers to re-think availability and communication regarding monitoring during labour. This has implications for childbirth education, hospital resources and guidelines, as well as how information is provided through different models of care.

*Promoting freedom of movement and physiology*

Fundamental, evidence-based practices for promoting physiology in labour, include ensuring women have choice, they are involved in decision-making, and they have freedom of movement, enabling them to adopt upright or comfortable positions in which to labour [8,16,35]. Cochrane systematic review evidence [16] highlights the benefits of enabling women to adopt comfort positions and freedom of movement in labour to promote normal physiology. Therefore, the findings of this study support the benefits of physiological approaches to labour, and highlight the potential impact that monitoring has on physiological childbirth, as well as on women's experience of choice and decision making in labour.

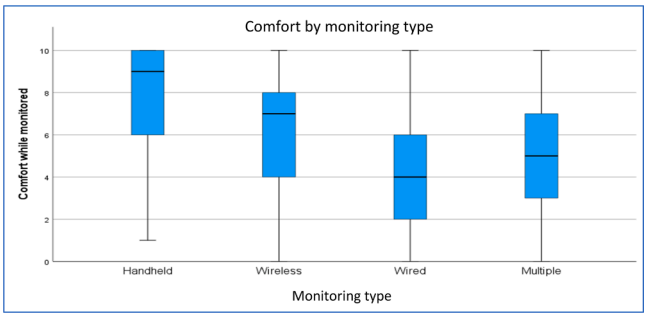


**Fig. 1.** Comfort while monitoring according to type of monitoring.

Survey research in this area also indicates that while the technology for wireless CTG monitoring has long existed, Australian hospitals remain slow to adopt or evaluate the use of wireless technology in routine clinical practice [12]. Wireless technology has been promoted as a method of facilitating greater freedom of movement in labour, however until this study, very little literature has addressed women's perspectives on choice, barriers to choice, information, availability and experiences of this and other forms of monitoring. Findings from this study support the current evidence base, demonstrating that monitoring via handheld Doppler and wireless CTG helped women in this study to feel comfortable by allowing them freedom of movement [21]. However, many women felt their options were limited, or that they didn't know that they had a choice in monitoring, limiting both capacity to choose and freedom of movement. When examining barriers to choice, women indicated that the likely barriers included feeling coerced into having monitoring, having limited choice due to availability or equipment failure, or that hospital policy and procedure dictated monitoring type, supporting the findings of Fox and colleagues [9].

Our findings also indicate the absence of informed consent about fetal monitoring for many women. most women in this survey felt they didn't have enough information about monitoring, creating a barrier to informed choice and potentially diminishing their experience of labour and birth. We know from state guidelines, that in the majority of states (Australian Capital Territory (ACT), New South Wales (NSW), Victoria (Vic), Queensland (Qld) and Western Australia (WA)), guidelines require verbal consent from the woman prior to the commencement of fetal monitoring during the intrapartum period and the discussion of fetal monitoring is recommended during the antenatal period [6,13,24,28,33]. Guidelines in NSW and Qld also state that if a woman chooses to decline intrapartum fetal monitoring, her wishes must be respected [24,28] and this is contingent on providing the woman with enough information to make an informed choice. Given our findings demonstrate that more than half of our respondents reported not being given enough information, it appears that what happens in practice does not align with fetal monitoring guidelines from at least five Australian States and Territories, echoing broader systemic issues in the literature about maternity care systems [14], not least of which is a seeming widespread disregard for bodily self-determination and processes for informed consent.

*Barriers to choosing type of monitoring*

In this study, barriers to choice highlighted systemic communication issues, which were associated with place of birth, parity and information provision by care providers. This also corresponded to perceived barriers where women felt that monitoring had not been discussed with them in sufficient detail. Previous research also discusses the impact of insufficient information and women's experiences of induction of labour, necessitating the use of continuous CTG monitoring and the consequent lack of mobility and pain caused [15]. This points clearly to a lack of adequate communication, shared decision making and agency in care. Additionally, other research by Plough et al. [26] indicates that hospital workflow management has a larger impact on women's birth outcomes than their individual risk profile [25,31] and that this management, paradoxically, while purporting to keep women safer, can actually increase risk [22]. We appreciate that workforce issues, such as levels of staffing, time and lack of continuity of care models limits care providers' capacity to deliver information about all facets of pregnancy, labour and birth. However, by supporting various continuity models of care, including out of hospital birth settings, and by ensuring that handheld and wireless monitoring technologies are available within hospitals, and that educational tools are developed to explain the pros and cons of monitoring types, women will have an increased capacity for decision making and an increased sense of agency.

*Utilising childbirth education*

The majority of women in this survey were first-time mothers, and the largest proportion indicated that they were monitored via wired CTG. Our findings suggest that women's comfort is compromised by the use of wired CTG monitoring. Not only was it reported as the least comfortable form of monitoring, but it was the form of monitoring that women were least likely to want to choose again. Women in this study also reported that they received little information from CBPE or from care providers about how wired CTG monitoring might impact their freedom of movement. This finding suggests that woman-centred care and decision making are not at the forefront of maternity care provision and that surveillance of the fetus takes priority over maternal comfort in policy and practice in many Australian hospitals.

This is potentially a missed opportunity for CBPE to inform women about options for monitoring, and provide some pathway for agency in decision making, as suggested by the literature [8,18,35]. If women received clear evidence-based information during their pregnancy about the potential impact of different forms of fetal monitoring technologies used in labour and birth, this may provide enough time for women to consider their options and make informed choices about monitoring. Understanding the indications for monitoring and what types of monitoring may be available is an important component of this. However, previous research highlights the impact that a lack of integration of evidence-based information from CBPE has on the overall care trajectory for women [18]. Information provided to women in CBPE or through women's own education and research is vulnerable to being undermined and derailed by a lack of support through routine antenatal care and in the intrapartum period.

Additionally, if CBPE is not integrated into routine antenatal care, and guidelines and hospital practices do not enable choice by having handheld and wireless monitoring technologies available for women and care providers, then little will be done to resolve the disconnect between evidence and practice.

*Impact of type of monitoring*

Most women who were monitored via handheld Doppler and wireless CTG monitoring reported that they felt they had enough information, whereas over 55 % of women who were monitored via wired CTG reported that they felt they did not have enough information. It is possible that when healthcare providers regard wired monitoring as the default method for fetal surveillance, as is suggested by policy and practice, they offer less information about monitoring options [11]. However, it may be the case for some clinicians that there is so much information required to be given to women that they feel they do not have time to incorporate more education in antenatal visits. This again suggests that routine care and workflow management [25] is not truly evidence-based and has a significant impact on the quality of maternity care as well as women's experiences of labour and the interventions they experience. Provision of routine and integrated information with clear risks and benefits of different forms of monitoring, with simple standardised visual decision aids being developed for this purpose should be a priority.

The findings of this study help us to better understand how women are informed (or not) about the evidence for fetal monitoring and their perceptions of choice regarding the form of fetal monitoring they receive in labour. It is our hope that this evidence will assist with the development of evidence-based resources to better assist informed decision making, increasing women's sense of agency in birth. Given that unconsented procedures are a major element of birth trauma, receiving increasing attention globally [14], providing women with evidence-based resources to enable decision making regarding monitoring should be a priority. It is incumbent upon maternity care providers, managers, and policy makers to provide women with humane forms of monitoring during labour, and accurate information about the benefits and disadvantages of different fetal monitoring technologies, including known impacts on freedom of movement in labour.

## Strengths and limitations

Survey responses were represented from all Australian States and Territories, and while the survey reached significant numbers, the population was more likely to represent women who had higher education and income levels, and more likely to be from rural/remote areas. Respondents were two years older than the national average of 31.1 years, and more were born in Australia than the average of 65.6 % [1]. There was lower representation of childbearing women who identify as Aboriginal and Torres Strait Islander than the average of 5.1 %, and women in metropolitan areas than the average of 73.9 % [1]. This may have influenced findings which are less representative of this population of women, in particular migrant or Aboriginal and Torres Strait Islander women, who are known to experience discrimination and lack of cultural safety in mainstream maternity care settings. However, research into the experiences of these women is a priority area [20,23]. Future research could explore priority groups' experiences of labour and the use of fetal monitoring technologies to capture the views of more diverse populations and in other languages.

## Conclusion

In this study, the majority of respondents felt they did not receive enough information about fetal monitoring to make informed decisions about what type of monitoring would be best for them. Continuous monitoring via wired CTG, was the most common form of monitoring, especially for first time mothers, but was generally found to be the least comfortable. Women preferred, but perceived barriers to having handheld and wireless monitoring, especially in rural and regional hospitals and private hospitals, with many women reporting that they didn't know they had a choice in monitoring type. Wireless and handheld monitoring should be made widely available, and continuity models of care and CBPE classes may be viable avenues to provide women with information about the risks and benefits of different forms of fetal monitoring, giving them time to make an informed choice about monitoring for labour and birth. It is incumbent on maternity systems to provide adequate resources for information, access to more humane equipment and appropriate models of woman-centred care.

## Ethics declaration

The study was approved by the University of Technology Sydney University Ethics Committee (approval no. ETH21–6563) and the University of Notre Dame Australia Ethics Committee (approval no. 2022–063S).

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## CRediT authorship contribution statement

Data are from selected outcomes from a national survey of Australian women, the WOMB Study. All authors contributed to the conduct of the study. In this analysis, K.L, designed the study with input from all other authors. K.L, V.S, and P.B analysed the quantitative data, with input from D.F, E.N, K.S and R.C. K.L. wrote the paper with input from all authors.

## Declaration of Competing Interest

Kate Levett and Deborah Fox are sub-editors for Women and Birth. Deborah Fox has received consultancy fees from Philips Healthcare for presentations to clinicians on mobility in labour, and research funding for two unrelated projects evaluating the Philips Avalon Beltless Solution (non-invasive fetal ECG). All other authors declare that they have no conflicts of interest to disclose.

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