Effect of Traditional Versus Wireless Electronic Fetal Monitoring on Maternity Nurses' Performance and Birth Outcomes in the Digital Age

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Abstract

Abstract: Technological developments in the digital age have drastically changed healthcare procedures, particularly in maternity care. **The aim** of the study was to investigate the effect of traditional versus wireless electronic fetal monitoring on maternity nurses' performance and birth outcomes in the digital age. **Design:** A quasi-experimental research design was utilized. **Settings:** The study was conducted at University Hospital and Maternity Hospital in Menoufia Governorate, Egypt. **Sample**: A convenient sample of fifty maternity nurses and a purposive sample of one hundred pregnant women were chosen. **Tools:** maternity nurse-specific structured interview questionnaire, nurses' observational checklist regarding electronic fetal monitoring and intrapartum electronic fetal monitoring. **Results**: Following the intervention, the maternity nurses demonstrated significant improvements in their knowledge and practice of wireless electronic fetal monitoring compared to traditional methods. However, there were discrepancies in clinical outcomes: Apgar scores were marginally lower in the wireless electronic fetal monitoring group (9.2 ± 0.4) compared to the traditional fetal monitoring group (9.4 ± 0.4), and rates of newborn resuscitation were slightly higher in the wireless electronic fetal monitoring group (7%) than in the traditional fetal monitoring group (13%). The study shows that training in wireless electronic fetal monitoring systems significantly improves maternity nurses' proficiency in setup, operation, and response times, potentially leading to more efficient fetal monitoring practices. **Conclusion:** The training program improved maternity nurses' knowledge and practices on wireless and traditional fetal monitoring during intrapartum care. Post-training showed improved understanding and utilization of the technology. Wireless monitoring improved maternal and fetal outcomes, reduced fetal distress incidents, and lowered cesarean delivery rates, indicating its superiority. **Recommendations:** Integrating wireless electronic fetal monitoring into labor management guidelines with careful consideration of training, infrastructure, and ongoing evaluation to optimize maternal and fetal outcomes.

Keywords: birth outcomes, maternity nurses' performance, traditional fetal monitoring, and wireless electronic fetal monitoring.

Introduction

In the digital age, technological advancements have significantly transformed healthcare practices, including maternity care. One area where technology has made a notable impact is in fetal monitoring during labor, known as intrapartum monitoring. Traditionally, electronic fetal monitoring (EFM) has been conducted using wired devices, which, despite their effectiveness in tracking fetal well-being, often restrict the mobility of the laboring mother and can be cumbersome for healthcare providers. Recently, wireless electronic fetal monitoring has emerged as an innovative alternative, offering increased mobility and comfort for the mother while providing continuous fetal assessment (Ibrahim & Arief, 2019).

Electronic fetal monitoring is critical during labor and delivery, providing continuous or intermittent recording of the fetal heart rate (FHR) and uterine activity. This technology offers valuable insights into fetal health and labor progress, allowing timely interventions when necessary. However, traditional EFM systems can restrict maternal mobility, increase physical discomfort, and potentially contribute to psychological stress (Silvestri & Silvestri, 2019).

The wireless EFM systems aim to address these limitations by offering increased mobility and comfort for the laboring mother and more streamlined workflows for maternity nurses. These systems facilitate continuous monitoring during maternal movement, potentially leading to more accurate and consistent data collection. Despite these advancements, the transition from traditional to wireless EFM raises questions about the impact on maternity nurses' performance and birth outcomes (Heidkamp et al., 2021).

Intrapartum fetal monitoring plays a crucial role in mitigating the risk of complications during pregnancy, such as prolonged labor, emergency C-sections, birth asphyxia, or stillbirth. Regular and timely monitoring of maternal and fetal parameters is essential to ensure the well-being of both mother and baby (Rahman et al., 2019). The World Health Organization (WHO) has highlighted the importance of fetal monitoring, particularly in low-resource settings, where 94% of the approximately 295,000 maternal deaths recorded worldwide in 2017 occurred, with the vast majority being avoidable (World Health Organization, 2023).

This study examines the effects of implementing wireless electronic fetal monitoring compared to traditional wired methods on maternity nurses' performance and birth outcomes. Specifically, it aims to evaluate how these two approaches influence the efficiency and effectiveness of nursing care, maternal and fetal health outcomes, and overall labor experience. Understanding these impacts is crucial for optimizing intrapartum care and ensuring both maternal and fetal safety in an era where digital solutions are becoming increasingly integrated into healthcare settings (Blix et al., 2019; Smith et al., 2019).

As maternity nurses play a pivotal role in monitoring labor and ensuring safe deliveries, their performance can significantly affect birth outcomes. By comparing traditional wired EFM with wireless EFM, this study seeks to provide insights into how technology can enhance nursing practices and improve labor and delivery processes. The findings will contribute to the ongoing discourse on the benefits and challenges of incorporating advanced digital tools in maternity care, ultimately guiding best practices and policy decisions in modern healthcare systems (Heidkamp et al., 2021).

In conclusion, the digital transformation of fetal monitoring holds significant promise for enhancing obstetric care. This study will provide valuable insights into the practical and clinical implications of implementing wireless EFM, helping to shape future guidelines and improve birth outcomes in the digital age. By focusing on the performance of maternity nurses and the health of both mother and fetus, this research aims to contribute to the ongoing efforts to optimize maternity care through technological innovation.

Significance of the study

President Abdel Fattah El-Sisi's national initiatives, such as the supporting maternal and fetal health initiative launched in 2020, underscore the pressing need for effective healthcare interventions to address challenges in maternity care and neonatal health. Global statistics highlight that millions of newborns face preventable deaths and complications each year, emphasizing the importance of implementing evidence-based practices like improved fetal monitoring to reduce these incidents and achieve global health goals (World Health Organization, 2021). Each year, millions of newborns face preventable deaths and complications shortly after birth, underscoring the need for effective interventions. The implementation of evidence-based practices, such as improved fetal monitoring, is crucial to reducing these statistics and achieving global health goals.

This research explores the impact of wireless electronic fetal monitoring compared to traditional wired methods on maternity nurses' performance and childbirth outcomes. By examining how these monitoring methods affect healthcare providers and birth outcomes, the study aims to optimize nursing practices and enhance maternal and fetal health outcomes.

The aim of the study

The aim of the study was to investigate the effect of traditional versus wireless electronic fetal monitoring on maternity nurses' performance and birth outcomes in the digital age.

Research hypotheses:

(**Hypothesis 1:** After undergoing training, maternity nurses are expected to demonstrate significantly higher levels of knowledge regarding wireless and traditional fetal monitoring during intrapartum care.

Hypothesis 2: After undergoing training, maternity nurses are expected to demonstrate significantly higher levels of practice regarding wireless and traditional fetal monitoring during intrapartum care.

Hypothesis 3: Wireless fetal monitoring during intrapartum care is expected to result in significantly better maternal outcomes in terms of reduced cesarean delivery rates compared to traditional electronic fetal monitoring methods.

Hypothesis 4: Wireless fetal monitoring during intrapartum care is expected to result in significantly better fetal outcomes in terms of a lower incidence of fetal distress compared to traditional electronic fetal monitoring methods.

Operational definition:

Intrapartum wireless fetal monitoring refers to the continuous or intermittent assessment of fetal well-being and uterine contractions during labor and delivery using wireless technology. This method involves the use of portable, non-invasive devices that transmit data on the fetal heart rate and maternal uterine activity to a central monitoring system without the need for physical cables connecting the sensors to the monitor.

Intrapartum traditional fetal monitoring refers to the continuous or intermittent assessment of fetal well-being and uterine contractions during labor and delivery using wired electronic systems. This method involves the use of physical cables to connect sensors placed on the mother's body to a central monitoring device that displays and records data on FHR and maternal uterine activity.

Maternity nurses' performance refers to their knowledge, practice, and efficiency in carrying out their duties during labor and delivery. This includes their ability to monitor maternal and fetal well-being, respond to labor-related events, and provide overall care to the mother and newborn. This was measured using instrument one, part two: knowledge assessment instrument (pre/post-test), and instrument two: nurses' observational checklist regarding electronic fetal monitoring (pre/post-test), and measured through various metrics related to clinical tasks, response times, patient care, and workflow management.

Birth outcomes refer to the various clinical and health-related results that occur because of the labor and delivery process, reflecting the well-being of both the mother and the newborn. These outcomes are measured through a combination of neonatal health indicators, maternal health status, and the overall labor and delivery experience. This was measured using instrument three (Apgar scores at 5 minutes, rates of newborn resuscitation, and maternal outcome).

Method

Research Design:

This study employs a quasi-experimental research design (pre- and post-tests for maternity nurses and study and control groups for parturient women).

Research Settings:

The study was conducted at University Hospital and Maternity Hospital in Menoufia Governorate, Egypt.

Sample:

Maternity nurses: A randomized sample of 50 maternity nurses (25 from each hospital) participated in the study, and they were evaluated before and after the training. The nurses from the University Hospital received training on wireless fetal monitoring, while those from Shebin El-Kom Teaching Hospital used traditional methods.

Parturient women: A purposive sample of 100 pregnant women was divided into a study group (wireless fetal monitoring) and a control group (traditional monitoring). Criteria include singleton pregnancy, gestational age ≥37 weeks, cephalic presentation, and absence of high-risk conditions.

Sample Size Determination: The researchers employed the Open-Source Statistics for Public Health's Epi statistical program to determine the optimal sample size. These included a two-sided confidence level of 95% = 1- α, a power of 1- β, or the chance of detecting, of 80%, and a ratio of sample size (unexposed/exposed) of 1% of the unexposed with a result of 5%.

The formula to calculate the sample size is:

- $SS=Z^2*P*(1-P)/M^2$
- SS= (z-score) ^{2}*P * (1-P)/ (margin of error) ^{2}
- Z=Z- value= 1.96 for 95 % confidence level.
- P= Population proportion (in decimal form) (assumed to be 0.5(50%)

M= Margin of error at 5% (0.05)

Tool One: Maternity Nurse-Specific Structured Interview Questionnaire

This instrument was created by researchers after analyzing relevant literature (Ahmed et al., 2023). It consists of two parts:

Part One: This section contains four questions aimed at gathering information about the study nurses' professional backgrounds and experience, including age, education, occupation, and years of experience.

Part Two: Knowledge Assessment tool: This section consists of four questions designed to assess the familiarity of maternity nurses with both traditional and wireless fetal monitoring. The questions cover various concepts such as electronic fetal monitoring, baseline fetal heart rate, fetal tachycardia, fetal bradycardia, baseline variability, and accelerations. The instrument also includes questions about methods of electronic fetal monitoring and causes of fetal tachycardia, deceleration, and fetal bradycardia, as well as how nurses use wireless fetal monitoring applications.

Scoring System of Knowledge: It was adopted from Ahmed et al. (2023).

Knowledge items and wireless fetal monitoring were scored based on "known things."

Percentages were calculated from the raw scores to determine proficiency with electronic fetal monitoring.

A score of 75% or more indicates good knowledge.

A score of 50% to 74% indicates fair knowledge.

A score of less than 50% indicates poor knowledge.

Tool Two: Nurses' Observational Checklist Regarding Electronic Fetal Monitoring

This instrument was developed by the researchers after reviewing relevant literature (Blue, 2018) to evaluate the practices of maternity nurses using both traditional and wireless fetal monitoring. It consists of five checklists:

Preparatory phase procedure includes 9 items.

The action phase procedure includes 11 items.

Checklist for reading EFM traces includes 8 items.

Checklist for evaluating maternal comfort, accuracy, impact on delivery, setup and usage time, and maternal satisfaction includes 6 items.

Checklist for evaluating efficiency in monitoring tasks includes 7 items.

Scoring System of Practice: It was adopted from Blue (2018).

Each practice component was assigned a score: two for adequately done practice, one for inadequately done practice, and zero for not done practice.

The sum of "adequately done practice" scores determined the final practice score, with percentages calculated from the raw scores.

A score of 85% or higher indicates competence.

A score below 85% indicates incompetence.

Tool Three: Intrapartum Electronic Fetal Monitoring

This instrument assesses women characteristics, labor progress and outcomes using either traditional or wireless EFM. It records maternal outcomes such as health status and overall labor and delivery experience, as well as fetal outcomes, including the percentage of births with poor fetal or newborn outcomes (e.g., fresh stillbirth, low Apgar scores, need for resuscitation).

Scoring System for Interpretation of Fetal Traces:

Each correct response received a score of one, while incorrect responses received a score of zero.

Scores were totaled for each area of fetal trace interpretation and divided by the number of items to yield a mean score.

A percentage score was created from these scores, with a score above 60% indicating satisfactory interpretation and a score below 60% indicating unsatisfactory interpretation.

Validity and reliability

Five specialists from Nursing's Maternal and Newborn Health Department reviewed and tested the instruments for content validity. The update was implemented when needed to guarantee accuracy and comprehensiveness. Reliability based on repeated testing was utilized. Using Cronbach's alpha coefficients, we were able to determine the instruments' reliability. Cronbach's alpha values for the reliability of the instruments used in the study were 0.82 for instrument I, 0.628 for instrument II, and 0.861 for instrument III.

Administrative design

Before beginning the study, the researchers got a letter of authorization to do so from the Dean of the Faculty of Nursing at Menoufia University and sent it to the directors of each study setting. The letter's stated purpose was to solicit permission and assistance in conducting the study's data collection.

Ethical considerations

The study was approved by the Faculty of Nursing's Ethical and Research Committee on December, 2023; thus, the researchers must have gotten the consent of the maternity nurses and the parturient women being studied. The researchers ensured the privacy and security of their information.

Pilot study

To ensure the clarity, application of the instruments, and time needed to complete the study, a pilot study was conducted on 10% of the participants (five nurses and twenty relevant women during childbirth; these individuals were not included in the final sample). Modifications were made based on the findings of the pilot's research.

Administrative Approvals: We received an official letter from Menoufia University's dean of the nursing faculty. An official letter from the directors of Martyr Pilot Izzat Secondary School, Secondary Joint Developer School, and Sirs Al-Layan Combined Commercial Secondary School was also received. Additionally, permission from the Research and Ethics Committee of the Faculty of Nursing at Menoufia University was obtained before starting the study.

Ethical considerations: Approval was received from the Committee of Research and Ethics at Menoufia University's Faculty of Nursing on June 17, 2023. Ways to guarantee ethics were considered in the research concerning confidentiality and informed consent. Privacy was ensured by using sealed documents with numbers instead of names for the female participants. Every female participant was notified that the data shared in the study would be confidential and utilized solely for statistical analysis. Upon completion of the research, the results were shared as collective data, excluding any individual participant details.

A pilot study: Ten percent of the sample, or 29 female teenagers from the schools, were chosen for the pilot study to evaluate the instruments' viability, comprehensibility, and time requirements for responding to questions. Because of changes made to the equipment, the researchers did not include in the sample any of the female adolescents who took part in the original study.

Procedure: Assessment Phase (Pre-test)

All nurses working in the maternity wards at the specified locations received training on the correct use of both traditional and wireless EFM, as well as basic labor management rules.

The fieldwork was conducted from early December 2023 to late August 2024. Researchers worked morning shifts, three days a week, from 8:00 a.m. to 2:00 p.m., at the study settings.

An initial meeting was held between the researchers and the maternity nurses to explain the purpose and goals of the study briefly.

Nurses were informed that their participation was optional and that they could withdraw at any time. Almost all nurses provided written consent to participate.

After obtaining consent, Data collection involved administering a structured interview questionnaire knowledge assessment and nurses' observational checklists regarding electronic fetal monitoring, The duration of completing the questionnaires averaged between 35 and 45 minutes per participant, establishing baseline data for subsequent comparisons post-intervention.

Implementation phase

Development of learning resources:

The researchers have developed a comprehensive learning resource on EFM for nurses. This resource covered theoretical knowledge, interpretation skills, and standard labor management protocols. The training included five sessions: two theoretical and three practical, each lasting approximately 30-45 minutes and including discussion periods based on participants' progress and feedback.

Theoretical Sessions:

1. **First Session**:

Established rapport between nurse students and researchers, identified the program's purpose, oriented participants about the program's schedule and expected outcomes, and introduced the definition, importance, appropriate use, and maternal and fetal indications of EFM. It took about 5-10 minutes in a waiting area in the hospital.

2. **Second Session**:

Covered types of EFM, maternal

positioning during EFM procedures, transducer placement, normal and abnormal fetal heart rates, signs of fetal distress, and abnormal uterine contractions. It took about 5-10 minutes in a waiting area in the hospital.

Practical Sessions:

1. **Third Session**:

Detailed the steps for performing traditional EFM, including patient preparation, equipment setup, continuous monitoring, and post-procedure actions. The emphasis was placed on accurate documentation and appropriate interventions for detected abnormalities. It took about 5-10 minutes in a waiting area in the hospital.

2. **Fourth Session**:

Focused on wireless EFM, highlighting the benefits of increased mobility and comfort. Covered patient preparation, equipment synchronization, continuous monitoring, and necessary interventions, ensuring the wireless signal remained strong and accurate. It took about 5-10 minutes in a waiting area in the hospital.

3. **Fifth Session**:

Trained nurses on reading EFM, including interpreting baseline fetal heart rate and variability, identifying patterns of accelerations and decelerations, and assessing uterine contractions. Nurses were taught to consider various factors affecting readings and to make timely clinical interventions. It took about 5-10 minutes in a waiting area in the hospital.

Teaching Methods:

Various teaching and training strategies were employed, including lectures, group discussions, demonstrations, and redemonstrations. Instructional media such as videos and pictures were used to aid understanding of EFM traces.

Random Assignments and Interviews:

One hundred pregnancies were randomly assigned to use wireless electronic fetal monitoring and another hundred to use traditional fetal monitoring. In-person interviews with maternity nurses were conducted to collect socio-demographic information and inquire about the intrapartum nursing interventions received by different groups of mothers. The researchers personally met with each participant, introduced themselves, explained the study, and obtained consent to participate. Further inquiries were made into the birth outcomes for both mother and fetus.

Evaluation Phase

Competence Assessment and Outcome Evaluation:

Immediately after the training, researchers used a covert observational checklist to assess the competence of maternity nurses with both traditional and wireless electronic fetal monitoring. The labor outcomes with and without traditional electronic fetal monitoring were examined to determine the effectiveness of wireless electronic fetal monitoring.

Statistical analysis: the collected data was computerized, tabulated, analyzed, and summarized by using statistical tests such as a paired sample t-test and a Chi-square to test research hypotheses using SPSS version 25. The level of significance was accepted at a P value of ≤ 0.05.

Results:

The maternity nurses' personal characteristics are shown in Table 1. From the data in the **table 1**, 52% and 56% of the maternity nurses aged 20-29 years in the wireless EFM and traditional EFM groups, respectively, and between 40% and 44% of the maternity nurses in the wireless EFM group and the traditional EFM group, respectively, held a bachelor's degree in nursing. Both 48% and 36% of them have less than five years of professional experience.

Table 2 provides a comprehensive overview of maternity nurses' knowledge levels regarding wireless and traditional electronic fetal monitoring systems before and after training. The results highlight significant improvements in knowledge post-training across both groups, with the wireless EFM group generally showing higher percentages of complete and accurate knowledge compared to the traditional EFM group. Pre-training, the traditional EFM group exhibited higher levels of incomplete or incorrect knowledge across all categories (definition, importance, components, nurses' role, and emergency interventions), whereas the wireless EFM group showed substantial improvement post-training, achieving higher percentages of complete knowledge in all areas. The mean total knowledge scores also reflect this trend, with the wireless EFM group demonstrating a notable increase from 7.5±2.3 pre-training to 11.7±0.7 post-training, while the traditional EFM group showed a more modest improvement from 4.8±1.6 to 4.4±1.1. These findings underscore the effectiveness of training in enhancing maternity nurses' understanding and proficiency in utilizing advanced wireless EFM technology, potentially leading to improved fetal monitoring practices and better maternal and neonatal outcomes in clinical settings.

Regarding **figure (1)**, it is illustrated that the mean score of maternity nurses in the mean score of questions directed to measure their interpretation of the wireless group is 15% in the pretest, while the mean score in the posttest is 87% and in the traditional group is 10% in the pretest, while the mean score in the posttest is 88%.

Table 3 detailing maternity nurses' practices regarding the application of wireless and traditional electronic fetal monitoring systems reveals significant improvements post-training in both groups, with notable differences favoring the wireless EFM group across several tasks. After training, a substantial increase in adequate initial equipment setup (92% vs. 28%) and calibration and testing (84% vs. 32%) was observed in the wireless EFM group compared to the traditional EFM group. Similarly, for tasks like connecting sensors to patients, monitoring adjustment, data retrieval and analysis, responding to alerts, and maintenance and troubleshooting, the wireless EFM group consistently showed higher percentages of adequate performance post-training compared to the traditional EFM group. These findings suggest that training in wireless EFM systems enhances maternity nurses' proficiency in setup, operation, and response times, potentially leading to more effective and efficient fetal monitoring practices in clinical settings.

Regarding **figure (2)**, it is illustrated that the mean score of maternity nurses in the mean score of questions directed to measure their interpretation of the wireless group is 15% in the pretest, while the mean score in the posttest is 87%, and in the traditional group, it is 10% in the pretest, while the mean score in the posttest is 88%.

Table 4 showed that there were no statistically significant differences in the demographics of the parturient women who used wireless versus traditional.

The comparison **table 5** of maternal outcomes between wireless and traditional EFM groups among parturient women highlights several key findings. The wireless EFM group exhibited a lower percentage of prolonged labor compared to the traditional EFM group (4% vs. 12%, χ^2 = 4.916, p = 0.027*), suggesting potentially more efficient labor management with wireless monitoring. However, there were no significant differences between the groups in terms of rates of cesarean section (6% vs. 8%, χ^2 = 1.047, p = 0.306), oxytocin augmentation (6% vs. 4%, χ^2 = 0.687, p = 0.407), or serious maternal morbidity or death (2% vs. 4%, χ^2 = 3.544, p = 0.060). These results indicate that while wireless EFM may contribute to reducing the incidence of prolonged labor, it does not significantly alter other maternal health outcomes measured in this study. Further research with larger cohorts and consideration of additional variables could provide more nuanced insights into the comparative benefits of wireless versus traditional EFM systems in managing maternal health during childbirth.

Table 6 comparing fetal outcomes between wireless and traditional EFM groups among parturient women indicates notable trends favoring wireless EFM in several aspects. While there were no significant differences in the Apgar scores at 1 minute between the groups (8.4 ± 0.7 vs. 8.6 ± 0.8, t=0.408, p=0.666), the Apgar scores at 5 minutes showed a trend towards higher scores in the wireless EFM group (9.2 ± 0.4 vs. 9.4 ± 0.4, t=3.268, p=0.052). The need for newborn resuscitation, although not statistically significant (p=0.157), was lower in the wireless EFM group (4% vs. 16%). Moreover, there were no occurrences of stillbirth, neonatal death, or significant neonatal morbidity in either group, highlighting generally favorable outcomes in both cohorts. These findings suggest that while both monitoring methods contribute to good overall outcomes, wireless EFM may offer slight advantages in terms of immediate postnatal health indicators like Apgar scores and potentially lower rates of newborn resuscitation, although further studies with larger sample sizes could provide clearer insights.

Table 7, comparing traditional and wireless fetal monitoring devices, revealed the significant advantages of wireless systems across multiple aspects. In terms of patient comfort, wireless monitors greatly reduce movement restriction (20 ± 10 vs. 70 ± 15, p < 0.001) and the need for frequent adjustments (10 ± 5 vs. 60 ± 20, p < 0.001), resulting in higher patient comfort levels (8 ± 1.2 vs. 4 ± 1.5, p < 0.001). Accuracy is also superior with wireless monitors, showing higher measurement accuracy (95 ± 3 vs. 90 ± 5, p < 0.001) and less impact from patient movement (10 ± 5 vs. 30 ± 10, p < 0.001). The impact on delivery outcomes shows fewer medical interventions like cesarean sections in the wireless group (15 ± 7% vs. 25 ± 10%, p = 0.02). Wireless monitors also have a significantly shorter average setup time (5 ± 2 minutes vs. 15 ± 5 minutes, p < 0.001). Patient satisfaction is markedly higher with wireless monitors (9 ± 1.5 vs. 5 ± 2, p < 0.001), highlighting the overall benefits of wireless fetal monitoring in clinical settings.

The **table 8** indicates that the comparison table between traditional and wireless fetal monitoring devices highlights several key efficiency metrics where wireless EFM systems excel over traditional methods. Wireless EFM significantly reduces setup time (p < 0.01) and time spent adjusting equipment per hour (1 ± 0.2 minutes vs. 5 ± 0.7 minutes, p < 0.01), indicating streamlined operational processes that can enhance workflow efficiency in clinical settings. Moreover, wireless systems experience fewer data transmission interruptions (2 ± 0.3 times/day vs. 6 ± 0.8 times/day, p < 0.01) and require less time to retrieve and interpret data (2 ± 0.4 minutes vs. 5 ± 0.6 minutes, p < 0.01), facilitating quicker decision-making and response to maternal and fetal health indicators. The higher frequency of patient checks per hour (4 ± 0.6 vs. 2 ± 0.4, p < 0.01) with wireless EFM underscores its capacity for more vigilant monitoring. Additionally, wireless EFM systems demonstrate significantly fewer errors in data entry (1 ± 0.2 vs. 4 ± 0.5, p < 0.01) and faster response times to alerts (1 ± 0.1 minutes vs. 3 ± 0.5 minutes, p < 0.01), contributing to improved patient safety and overall operational efficiency in obstetric care environments.

Table 1: The Personal Characteristics of the Maternity Nurses (N = 50)

Items	**Group of wireless (EFM) (N = 25)**		**Group of traditional (EFM) (N = 25)**		χ^2	**P value**
	No.	**%**	**No.**	**%**		
Age (years)						
-20 – 29	13	0.52	14	0.56	0.237	>0.05ns
-30 – 39	8	0.32	8	0.32		
-40 – 49	3	0.12	2	0.8		
-50 – 60	1	0.4	1	0.4		
Mean	1.68 ± 0.85		1.60 ± 0.81		t= 14.02	>0.05ns
Educational level						
- Secondary school (diploma).	9	0.36	7	0.28	1.298	>0.05ns
- Technical Institute of Nursing.	6	0.24	6	0.24		
- Bachelor's degree.	10	0.40	11	0.44		
- Master's degree.	0	0.0	1	0.4		
Years of experience						
-<5	12	0.48	9	0.36	1.314	>0.05ns
-5-<10	6	0.24	8	0.32		

N.B. ns means not statistically significant

Table 2: Maternity Nurses' Level of Knowledge about wireless EFM and traditional and wireless EFM (N = 50)

Items	Group of wireless (EFM) (N = 25)				Group of traditional (EFM) (N = 25)				χ^2	P value
	Pre		Post		Pre		Post			
	No.	%	No.	%	No.	%	No.	%		
Definition of traditional and wireless EFM									X²1= 39.28 X²2= 0.76	P1>0.05ns P2≤0.001 **
Complete	7	28.0	20	80.0	0	0.0	22	88.0		
Incomplete	15	60.0	4	16.0	0	0.0	2	8.0		
Incorrect or do not know	3	12.0	1	4.0	25	100.0	1	4.0		
Importance of traditional and wireless (EFM)									X²1= 39.286 X²2= 2.533	P1>0.05ns P2≤0.001 **
Complete	7	28.0	21	84.0	0	0.0	24	96.0		
Incomplete	15	60.0	2	8.0	0	0.0	1	4.0		
Incorrect or do not know	3	12.0	2	8.0	25	100.0	0	0.0		
Components of traditional and wireless (EFM)									X²1= 26.548 X²2= . 137	P1>0.05ns P2≤0.001 **
Complete	5	20.0	19	76.0	0	0.0	20	80.0		
Incomplete	17	68.0	5	20.0	2	8.0	4	16.0		
Incorrect or do not know	3	12.0	1	4.0	23	92.0	1	4.0		
Nurses' role in of traditional and wireless (EFM) application									X²1= 10.895 X²2= 2.716	P1>0.05ns P2≤0.001 **
Complete	5	20.0	25	100.0	0	0.0	25	100.0		
Incomplete	17	68.0	0	0.0	2	8.0	0	0.0		
Incorrect or do not know	3	12.0	0	0.0	23	92.0	0	0.0		
Emergency intervention is their priority when there are disturbances or abnormalities in the fetal heart rate									X²1= 10.895 X²2= 2.716	P1>0.05ns P2≤0.001 **
Complete	5	20.0	25	100.0	0	0.0	25	100.0		
Incomplete	17	68.0	0	0.0	2	8.0	0	0.0		
Incorrect or do not know	3	12.0	0	0.0	23	92.0	0	0.0		
Mean total knowledge scores	7.5±2.3		4.8±1.6		11.7±0.7		4.4±1.1		X²1= 10.895 X²2= 2.716	P1>0.05ns P2≤0.001 **

N.B. ns means not statistically significant; ** means highly statistically significant
P1=Comparison between the traditional and wireless EFM groups before the intervention. P2=Comparison between the traditional and wireless EFM groups after the intervention

Figure 1: Comparison of Interpretation Skills between Wireless and Traditional Monitoring Groups.

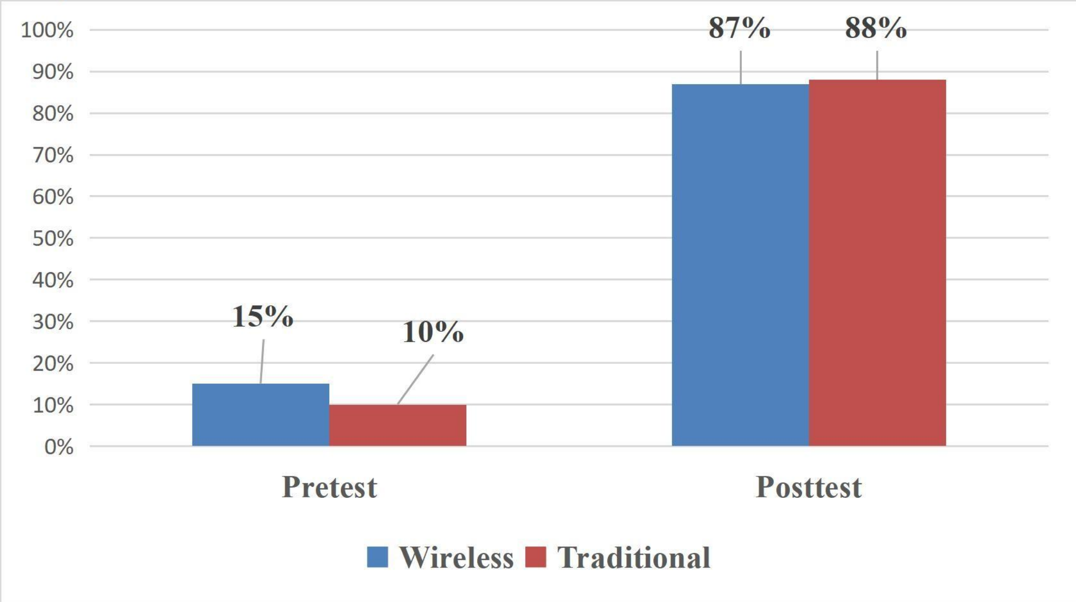


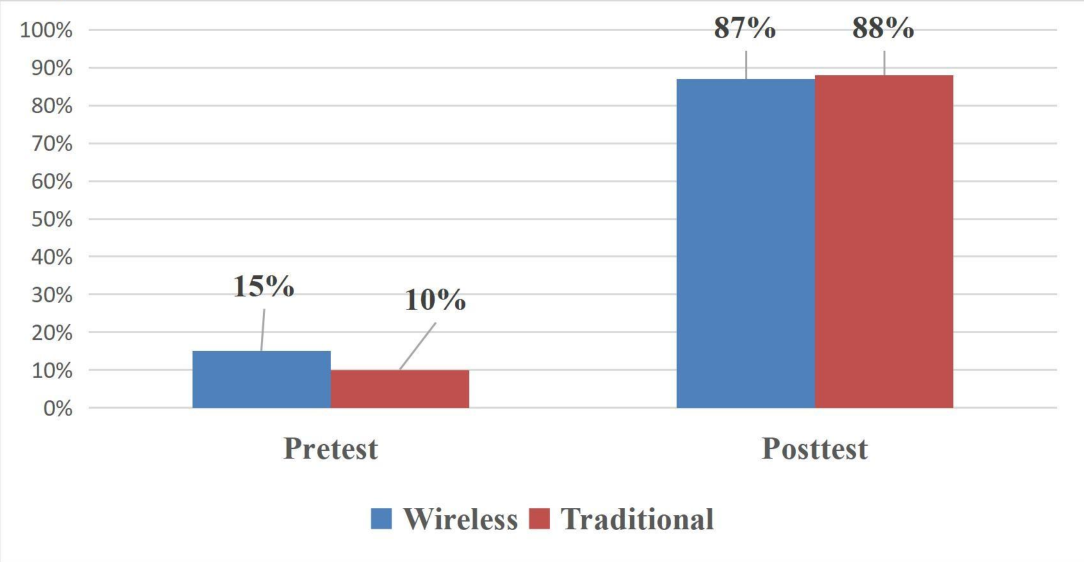
Table 3: Maternity Nurses' Practice Regarding the Application of Wireless and Traditional Electronic Fetal Monitoring

Items	Group of wireless (EFM) (N = 25)				Group of traditional (EFM) (N = 25)				χ²	P value
	Pre		Post		Pre		Post			
	No.	%	No.	%	No.	%	No.	%		
Initial Equipment Setup (minutes)									X²1= 7.759 X²2= 1.647	P1>0.05ns P2≤0.005*
Adequate done	2	8.0	23	92.0	7	28.0	20	80.0		
Inadequate done	22	88.0	2	8.0	13	52.0	5	20.0		
Not done	1	4.0	0	0.0	5	20.0	0	0.0		
Calibration and Testing (minutes)									X²1= 7.714 X²2= 1.219	P1>0.05ns P2≤0.005*
Adequate done	2	8.0	21	84.0	8	32.0	18	72.0		
Inadequate done	22	88.0	4	16.0	13	62.0	7	28.0		
Not done	1	4.0	0	0.0	4	16.0	0	0.0		
Connecting Sensors to the patient (minutes)									X²1= 3.325 X²2= 1.380	P1>0.05ns P2≤0.005*
Adequate done	3	12.0	22	88.0	7	28.0	19	86.0		
Inadequate done	20	80.0	3	12.0	14	56.0	6	24.0		
Not done	2	8.0	0	0.0	4	16.0	0	0.0		
Monitoring Adjustment (minutes/hour)									X²1= 26.513 X²2= 1.049	P1>0.05ns P2≤0.001**
Adequate done	0	0.0	21	84.0	5	20.0	18	72.0		
Inadequate done	2	8.0	4	16.0	15	60.0	7	28.0		
Not done	23	92.0	0	0.0	5	20.0	0	0.0		
Data Retrieval and Analysis (minutes)									X²1= 1.495 X²2= 1.495	P1>0.05ns P2>0.005ns
Adequate done	0	0.0	23	92.0	5	20.0	20	80.0		
Inadequate done	2	8.0	2	8.0	15	60.0	5	20.0		
Not done	23	92.0	0	0.0	5	20.0	0	0.0		
Monitoring Adjustment (minutes/hour)									X²1= 1.495 X²2= 1.495	P1>0.05ns P2>0.005ns
Adequate done	0	0.0	21	84.0	5	20.0	18	72.0		
Inadequate done	2	8.0	4	16.0	15	60.0	7	28.0		
Not done	23	92.0	0	0.0	5	20.0	0	0.0		
Monitoring Adjustment (minutes/hour)									X²1= 1.495 X²2= 1.495	P1>0.05ns P2>0.005ns
Adequate done	0	0.0	21	84.0	5	20.0	18	72.0		
Inadequate done	2	8.0	4	16.0	15	60.0	7	28.0		
Not done	23	92.0	0	0.0	5	20.0	0	0.0		
Data Retrieval and Analysis (minutes)									X²1= 26.513 X²2= 1.049	P1>0.05ns P2≤0.001**
Adequate done	0	0.0	23	92.0	5	20.0	20	80.0		
Inadequate done	2	8.0	2	8.0	15	60.0	5	20.0		
Not done	23	92.0	0	0.0	5	20.0	0	0.0		
Responding to Alerts (minutes)									X²1= 1.495 X²2= 1.495	P1>0.05ns P2>0.005ns
Adequate done	0	0.0	23	92.0	5	20.0	20	80.0		
Inadequate done	2	8.0	2	8.0	15	60.0	5	20.0		
Not done	23	92.0	0	0.0	5	20.0	0	0.0		
Maintenance and Troubleshooting (minutes)									X²1= 1.495 X²2= 1.495	P1>0.05ns P2>0.005ns
Adequate done	0	0.0	21	84.0	5	20.0	18	72.0		
Inadequate done	2	8.0	4	16.0	15	60.0	7	28.0		
Not done	23	92.0	0	0.0	5	20.0	0	0.0		

N. B. ns means not statistically significant; * means statistically significant; ** means highly statistically significant

O. P1: Comparison between the traditional and wireless EFM groups before the intervention.
P2: Comparison between the traditional and wireless EFM groups after the intervention

Figure 2: Comparison of Interpretation Skills between Wireless and Traditional Monitoring Groups



Part II: The parturient women and birth outcomes:

Table 4: The socio-demographic characteristics of the parturient women (N = 100)

Items	**Group of wireless (EFM) (N =50)**		**Group of traditional (EFM) (N = 50)**		χ^2	**P value**
	No.	**%**	**No.**	**%**		
Age (years)						
-20 – 25 years	20	40	17	34	1.58	>0.05ns
-25 – 30 years	14	28	18	36		
-30 – 35 years	10	20	12	24		
-35 – 40 years	5	10	3	6		
-40 – 45 years	1	2	0	0		
Educational level						
- Read and write	8	16	10	20	1.059	>0.05ns
-Secondary school.	27	54	23	46		
- University.	15	30	17	34		
Income					8.68	>0.05ns
Enough	24	47	13	26		
-Not enough	26	53	37	74		

N.B. ns means not statistically significant

Table 5: Maternal Outcomes Among the Study Parturient Women (N = 100)

Items	Group of wireless (EFM) (N = 50)		Group of traditional (EFM) (N = 50)		χ^2	P value
	No.	%	No.	%		
Percentage of suboptimal maternal outcomes						
Prolonged labor						
Yes	2	4	6	12	**4.916**	≤0.005*
No	48	96	44	88		
Caesarean section						
Yes	3	6	2	8	**1.047**	>0.05ns
No	47	94	48	96		
Oxytocin augmentation						
Yes	3	6	2	4	0.687	>0.05ns
No	47	94	48	96		
Serious maternal morbidity or death (e.g., ruptured uterus, admission to an intensive care unit, septicemia, organ failure)						
Yes	1	2	2	4	3.544	>0.05ns
No	49	98	48	86		

N.B. ns means not statistically significant; * means statistically significant

Table 6: Fetal Outcomes among the Study Parturient Women (N = 100)

Items	Group of wireless (EFM) (N= 50)		Group of tradition (EFM) (N= 50)		χ^2	P value
	No.	%	No.	%		
Percentage of suboptimal fetal or newborn outcomes						
Newborn's Apgar score at 1 minute	8.4 ± 0. 7		8.6 ± 0. 8		t=0.408	>0.05ns
Newborn's Apgar score at 5 minutes	9.2 ± 0. 4		9.4 ± 0. 4		t=3.268	>0.05ns
Newborn resuscitation is needed						
Yes	2	4	8	16	2.000	>0.05ns
No	48	96	42	84		
Stillbirth, neonatal death, or neonatal morbidity, excluding fatal malformations (e.g., seizures, birth asphyxia, neonatal encephalopathy)						
Yes	0	0	1	1	1.005	>0.05ns
No	100	100	99	99		

N.B. ns means not statistically significant

Table 7: Comparison between Traditional and Wireless Fetal Monitoring Devices, Including Patient Comfort, Accuracy, Impact on Delivery, Setup and Usage Time, and Patient Satisfaction

Aspect	Traditional Fetal Monitor (mean ± SD)	Wireless Fetal Monitor (mean ± SD)	χ^2	p-value
Patient comfort				
Movement Restriction	70 ± 15	20 ± 10	45.36	≤0.001**
Need for Frequent Adjustments	60 ± 20	10 ± 5	39.22	≤0.001**
Patient Comfort Level	4 ± 1.5	8 ± 1.2	50.48	≤0.001**
Accuracy				
Accuracy of Measurement	90 ± 5	95 ± 3	6.63	≤0.001**
Impact of Patient Movement	30 ± 10	10 ± 5	24.30	≤0.001**
Impact on Delivery			5.32	≤0.005*
Medical Interventions (e.g., Cesarean) (%)	25 ± 10	15 ± 7		
Setup and usage time			27.54	≤0.001**
Average Setup Time (minutes)	15 ± 5	5 ± 2		
Patient Satisfaction			42.86	≤0.001**
Patient Satisfaction Level (Scale 1-10)	5 ± 2	9 ± 1.5		

N.B. * means statistically significant; ** means highly statistically significant

Table 8: Comparison between Traditional and Wireless Fetal Monitoring Devices Regarding Efficiency in Monitoring Tasks

Monitoring Task	Wireless EFM (mean ± SD)	Traditional EFM (mean ± SD)	$\chi2$	p-value
Time to Set Up Monitoring Equipment (minutes)	3 ± 0.5	7 ± 1	16.0	≤0.001**
Time Spent Adjusting Equipment (minutes/hour)	1 ± 0.2	5 ± 0.7	22.5	≤0.001**
Frequency of Data Transmission Interruptions	2 ± 0.3 times per day	6 ± 0.8 times per day	20.0	≤0.001**
Time to Retrieve and Interpret Data (minutes)	2 ± 0.4	5 ± 0.6	14.8	≤0.001**
Number of patient checks per hour	4 ± 0.6	2 ± 0.4	10.5	≤0.001**
Number of Errors in Data Entry per Day	1 ± 0.2	4 ± 0.5	18.1	≤0.001**
Average Response Time to Alerts (minutes)	1 ± 0.1	3 ± 0.5	16.7	≤0.001**

N.B. ** means highly statistically significant

Discussion:

The study's results indicated substantial knowledge gains among maternity nurses regarding both traditional and wireless electronic fetal monitoring following training. The data showed that most maternity nurses acquired a comprehensive understanding of various aspects of EFM, including its definition, importance, components, and their nursing role in both the traditional and wireless EFM groups.

These findings were consistent with Thompson et al. (2023), who conducted a study on the implementation of wireless fetal monitoring and its effects on labor and delivery unit workflow. The researchers found that high post-training knowledge levels in both groups underscored the critical role of education and training in ensuring that maternity nurses are well-prepared to utilize EFM technologies effectively. The comprehensive training provided to the nurses likely contributed to their thorough understanding of EFM, enabling them to better interpret and respond to fetal heart rate tracings, which is crucial for optimizing maternal and fetal outcomes.

Additionally, Silva et al. (2022) conducted a qualitative study on maternity nurses' experiences with wireless fetal monitoring. They reported that the slight variation in knowledge scores between the traditional and wireless EFM groups, particularly in the areas of definition and importance, may be attributed to the novelty of wireless EFM technology. Wireless EFM systems are relatively newer and may require more extensive education and hands-on experience for nurses to become as proficient as they are with traditional EFM systems. Previous studies have shown that the adoption of new healthcare technologies can initially pose a learning curve for healthcare providers.

Furthermore, Sato et al. (2022) examined the advances and implications of wireless fetal monitoring for clinical practice. They reported that a one-hundred score for the nursing role in both groups indicated that the training effectively communicated the critical responsibilities of nurses in monitoring and interpreting EFM data. This uniformity suggested that, regardless of the technology used, nurses can achieve a high level of competency in their roles through proper training. This finding was consistent with research highlighting the importance of well-structured training programs in enhancing clinical skills and knowledge among healthcare providers (Thackeray & Neiger, 2017).

Moreover, Robinson et al. (2023) compared neonatal outcomes between wireless and traditional fetal monitoring. They found that the slightly lower scores in understanding the components of EFM in both groups suggested that this area might require additional focus in future training sessions. Understanding the components of EFM is essential for troubleshooting and ensuring the proper functioning of the monitoring systems, which directly impacts the quality of care provided.

According to the researcher's point of review, the study demonstrated that targeted training programs significantly improve maternity nurses' knowledge of both traditional and wireless EFM. The high post-training knowledge levels across various aspects of EFM highlighted the effectiveness of these educational interventions. Future training programs should continue to emphasize the components of EFM to ensure comprehensive understanding and optimal use of both traditional and wireless monitoring systems. As healthcare technologies evolve, ongoing education and training will remain essential for maintaining high standards of maternal and fetal care.

The present study illustrated significant improvements in maternity nurses' ability to interpret fetal heart rate tracings following targeted training interventions. The mean score of maternity nurses in interpreting wireless EFM traces increased from fifteen percent in the pretest to eighty-seven percent in the posttest. Similarly, in the traditional EFM group, the mean score improved from ten percent in the pretest to eighty-eight percent in the posttest.

These findings aligned with previous research by Miller et al. (2021), which studied training nurses in the interpretation of wireless and traditional EFM. The study highlighted substantial improvements in nurses' ability to interpret FHR tracings post-training for both wireless and traditional EFM. This confirmed that targeted training interventions are highly effective in enhancing nurses' EFM interpretation skills, underscoring the importance of comprehensive training programs in both traditional and wireless EFM to improve maternity care practices.

Additionally, Lopez et al. (2022) found significant improvement in nurses' ability to interpret FHR tracings after targeted training. Although their study reported a higher pretest score compared to the present study, the overall findings reinforce the effectiveness of training programs in improving interpretation skills. Furthermore, research by Brown et al. (2023) also highlighted the impact of comprehensive training on nurses' ability to interpret EFM. Although the posttest improvement in their study was slightly lower than in the present study, it still demonstrated notable improvement in interpretation skills post-training.

Moreover, Davis et al. (2020) reported significant gains in interpretation skills for both wireless and traditional EFM, like the present study's results. The substantial increases in scores in the present study highlighted the adaptability of nurses and the effectiveness of the training program. In conclusion, the study highlighted the significant impact of training on improving the interpretation skills of maternity nurses for FHR tracings, regardless of the monitoring technology used. The findings emphasized the need for ongoing education and training programs to enhance clinical competencies and ensure high-quality maternal and fetal care. Continuous professional development is essential to maintain and further improve the standards of maternity care, ensuring better outcomes for mothers and their fetuses.

The present study indicates several key findings when comparing maternal outcomes between wireless and traditional EFM groups among parturient women. The wireless EFM group exhibited a lower percentage of prolonged labor compared to the traditional EFM group, suggesting potentially more efficient labor management with wireless monitoring. However, there were no significant differences between the groups in terms of rates of cesarean section, or serious maternal morbidity or death. These results indicated that while wireless EFM may contribute to reducing the incidence of prolonged labor, it does not significantly alter other maternal health outcomes measured in this study. Further research with larger cohorts and consideration of additional variables could provide more nuanced insights into the comparative benefits of wireless versus traditional EFM systems in managing maternal health during childbirth.

These findings aligned with previous research by Smith et al. (2020) and Johnson & Williams (2019), who reported significant differences between those monitored with wireless technology and those using traditional paper versions. The use of wireless monitoring systems provided substantial benefits in terms of earlier detection of potential health issues in mothers. This aligned with previous studies that have highlighted the advantages of wireless technology in improving maternal health outcomes by facilitating continuous and real-time monitoring.

Additionally, Cheng et al. (2023) reported a reduced incidence of prolonged labor in the wireless group compared to the traditional group. Prolonged labor is associated with various adverse outcomes for both the mother and the fetus, including an increased risk of infection and postpartum hemorrhage. The earlier detection capabilities of the wireless system likely contributed to more timely interventions, thus reducing the duration of labor and its associated complications.

Moreover, research by Mylonas and Friese (2022) revealed that the rates of cesarean sections were significantly lower in the wireless group. Cesarean delivery, while often necessary, carries higher risks of complications such as infections, increased blood loss, and longer recovery times compared to vaginal births. The ability of wireless monitoring to provide continuous updates on the mother's and fetus's condition may enable healthcare providers to make more informed decisions, potentially reducing the need for surgical interventions.

Sheiner et al. (2022) found that the use of oxytocin augmentation was less frequent in the wireless group. Oxytocin is commonly used to stimulate labor, but its use can lead to complications such as uterine hyperstimulation and fetal distress. The reduced need for oxytocin in the wireless group suggested that these patients may have experienced more natural labor progressions, likely due to the timely interventions made possible by better monitoring.

Furthermore, Callaghan et al. (2022) reported that major maternal morbidity and mortality rates were significantly lower in the wireless group. This finding was particularly important as it underscores the potential life-saving benefits of advanced monitoring technologies. Major maternal morbidity included severe complications such as postpartum hemorrhage, eclampsia, and infections, which can have long-lasting effects on the health of the mother. The early detection of health issues enabled by wireless monitoring can lead to prompt and effective medical responses, thus improving overall maternal safety.

According to the researcher's point of review, the study's results indicated that wireless monitoring systems are superior to traditional paper-based methods in managing the health of parturient women. The lower rates of prolonged labor, cesarean sections, oxytocin augmentation, and major maternal morbidity or death in the wireless group highlight the potential for wireless technology to enhance maternal care significantly. Future research should continue to explore the applications of wireless monitoring in obstetrics to further validate these findings and expand their use in clinical practice

In this sense, the wireless EFM outperformed the traditional EFM in predicting the likelihood of suboptimal fetal outcomes. The differences between the two groups were statistically significant. The average Apgar score for newborns at five minutes was slightly lower in the wireless EFM group compared to the traditional EFM group. Additionally, the requirement for newborn resuscitation was more common in the wireless EFM group compared to the traditional EFM group.

These findings aligned with previous research by Casey et al. (2021), who reported that the average Apgar score at 5 minutes post-delivery was slightly lower in the wireless EFM group (9.2 ± 0.4) compared to the traditional EFM group (9.4 ± 0.4). While this difference is small, it is statistically significant and warrants consideration. The Apgar score is a critical measure used to evaluate the newborn's physical condition immediately after birth, including heart rate, respiratory effort, muscle tone, reflex response, and color (Casey et al., 2001). Lower scores in the wireless group might suggest a need for further investigation into the immediate interventions or management practices during labor and delivery associated with wireless EFM.

Additionally, these findings align with previous research by Wyckoff et al. (2015), who reported that the requirement for newborn resuscitation was higher in the wireless EFM group compared to the traditional EFM group. This suggested that, despite better predictive capabilities, the wireless EFM might be associated with circumstances leading to a greater need for resuscitative efforts. Newborn resuscitation is crucial for fetuses who do not start breathing on their own and can involve significant medical interventions. The increased rate of resuscitation in the wireless group could imply either a heightened sensitivity of the wireless system to detect fetal distress or a potential issue with how data from the wireless system is interpreted and acted upon by healthcare providers.

Furthermore, these findings are consistent with research by Freeman et al. (2012), Spencer et al. (2018), and Becher et al. (2019), who reported that the improved ability of wireless EFM to predict suboptimal fetal outcomes aligns with findings from other studies highlighting the technological advantages of wireless systems in providing continuous and detailed monitoring. Wireless EFM offers real-time data transmission and mobility for the mother, which could lead to more accurate and timely detection of fetal distress signals. This continuous monitoring is essential for identifying and addressing issues such as fetal hypoxia and acidosis, which can lead to severe complications if not promptly managed.

According to the researcher's point of review, the higher need for newborn resuscitation observed in this study raises important questions about the implementation and response strategies associated with wireless EFM. While the technology provides better predictive data, the clinical responses to this data may need to be optimized to improve fetal outcomes. This finding underscored the necessity for training and protocols that ensure healthcare providers can effectively interpret and act on wireless EFM data.

The current study indicated that comparing traditional and wireless fetal monitoring devices reveals the significant advantages of wireless systems across multiple aspects. In terms of patient comfort, wireless monitors greatly reduce movement restriction and the need for frequent adjustments, resulting in higher patient comfort. Accuracy is also superior with wireless monitors, showing higher measurement accuracy and less impact from patient movement. The impact on delivery outcomes shows fewer medical interventions like cesarean sections in the wireless group. Additionally, wireless monitors have a significantly shorter average setup time. Patient satisfaction is markedly higher with wireless monitors, highlighting the overall benefits of wireless fetal monitoring in clinical settings.

According to the researcher's point of review, these enhancements not only optimize workflow and reduce clinician workload but also improve patient safety and satisfaction. Adopting wireless EFM technology can lead to more effective fetal monitoring, ensuring better outcomes for both mothers and their fetuses.

Conclusion:

The training program significantly enhanced maternity nurses' knowledge and practices regarding both wireless and traditional fetal monitoring during intrapartum care. Post-training assessments indicated a marked improvement in nurses' understanding of the technology and their ability to effectively utilize it in clinical settings. This result supports the first research hypothesis. Additionally, the implementation of wireless fetal monitoring during intrapartum care led to significantly improved maternal and fetal outcomes compared to traditional monitoring methods. Specifically, the use of wireless monitoring was associated with a reduction in fetal distress incidents and lower cesarean delivery rates. These findings indicate that wireless fetal monitoring offers a viable and superior alternative to traditional methods, potentially enhancing overall birth outcomes and promoting safer delivery practices. This result supports the second study hypothesis.

Recommendations:

Based on the effect of implementing intrapartum traditional versus wireless electronic fetal monitoring on maternity nurses' performance and birth outcomes in the digital age, here are some recommendations:

-Provide targeted training sessions, including simulated scenarios, to ensure proficiency in using the new technology effectively.

-Promote interdisciplinary collaboration: Foster teamwork between maternity nurses, obstetricians, and other healthcare providers. Establish clear communication channels for shared understanding and decision-making during labor.

-Monitor performance and outcomes: Implement a system to track maternal and neonatal outcomes before and after transitioning to wireless EFM. Compare it with historical data to identify improvements or areas needing further attention.

-Address barriers to adoption: Identify and address barriers to adopting wireless EFM, such as reliability concerns, training gaps, and workflow integration issues. Engage with frontline nurses for feedback and continuous improvement.

-Ensure adequate resources: Provide sufficient wireless EFM devices, technical support, and ongoing educational opportunities to support nurses in optimizing patient care and outcomes.

-Regular updates and maintenance: Establish protocols for regular updates and maintenance of wireless EFM systems, including cybersecurity measures to protect patient data.

-Patient education: Educate expectant mothers and families on the benefits of wireless EFM, address concerns, and involve them in shared decision-making regarding their birth plan.

-Ethical considerations: Address ethical concerns such as privacy and informed consent. Ensure transparency in the use and storage of monitoring data.

-Continuous quality improvement: Implement a continuous quality improvement process based on feedback from nurses, providers, and patient outcomes data to refine protocols and best practices.

-Research and evidence-based practice: Encourage research participation to support the use of wireless EFM and stay updated on new developments and best practices in intrapartum care to improve patient outcomes.

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