Self-Efficacy of Nurses with Intermittent Auscultation Before and After an Education on a New Protocol

by

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Bachelor of Science in Nursing-Honors, University of Pittsburgh, 2022

Submitted to the Graduate Faculty of the

University Honors College

of the requirements for the degree of

Bachelor of Science in Nursing

University of Pittsburgh

2022

UNIVERSITY OF PITTSBURGH

UNIVERSITY HONORS COLLEGE

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Introduction: Self-efficacy is defined as a person's internal judgement of one's own abilities to perform certain behaviors. Self-efficacy is conceptualized by four domains: performance experiences, observational learning, verbal persuasion, and emotional status. A birthing unit at a tertiary referral center formalized the practice of intermittent auscultation (IA) for low-risk patients admitted for labor by developing a new protocol. The question investigated was whether education affected nurses' self-efficacy with IA. The objectives were to develop a questionnaire to evaluate nurse's self-efficacy with IA and to evaluate responses to the questionnaire for change pre- and post-education on the new protocol for IA.

Methods: This observational study was conducted with a convenience sample of new labor and delivery nurses who attended an education session about fetal monitoring. Demographic data was collected about age, nursing education degree, years of experience, and years worked in a labor and delivery unit. The investigator-developed questionnaire was distributed pre- and post-education session to assess self-efficacy. Items distributions for each item pre- and post-education were analyzed. A correlation matrix was completed with an accepted range set as 0.6-0.8. A Cronbach's alpha of pre-education responses was conducted at $p<0.005$. A Wilcoxon signed-rank test was completed at an item level with an alpha set to 0.05. All data was analyzed using SPSS 28.0.1.0.

Results: The sample consisted of 43 subjects who were mostly nurses who had 0-10 years' experience as a nurse or experience in a labor and delivery unit. The item that had the greatest change post-education was item 1, "I have sufficient knowledge of what intermittent auscultation is", the proportion of agree and strongly agree increased by n=33 (77%). The correlation matrix reported 11 instances in the acceptable range. The Cronbach's alpha was 0.91. The related-samples Wilcoxon signed rank test showed that seven questions demonstrated statistically significant differences.

Conclusion: The questionnaire was reliable and accurately measured the construct of self-efficacy with IA. A lecture-based education session on IA increased self-efficacy in each of its domain**s.** A factor analysis should be conducted of this tool. This would produce a scale that focuses on IA education and the domains of self-efficacy, which has not been researched.

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1.0 Introduction

Self-efficacy is defined as a person's internal judgement of one's own abilities to perform certain behaviors. Knowledge and skills alone are insufficient to accomplish a desired outcome. Self-efficacy mediates the relationship between knowledge and action (Bandura, 1997).

Evaluation of the fetal heart rate (FHR) is a clinical assessment that detects fetal responses to the intrauterine environment during gestation and birth. Characteristics of the FHR potentially indicate overall oxygenation in fetal circulation (Drummond & Rust, 2021), making assessment of the FHR an important vital sign during the antepartum and intrapartum periods. The goal of FHR assessment during the intrapartum period is to detect fetal tolerance or intolerance to labor (Stout & Cahill, 2011), allowing for preemptive obstetrical interventions to decrease morbidity and mortality (Tomassao et al., 2019). Consequently, FHR assessment during labor is a best practice that should be incorporated into standards of all birth settings (American College of Nurse Midwives, 2015).

There are several methods for assessing the FHR during labor. The most common method is electronic fetal monitoring (EFM), or cardiotocography (CTG) (Miller, et al., 2022). Less commonly, the FHR may be assessed in low-risk patients with intermittent auscultation (IA). EFM can provide a continuous, visual tracing of the FHR and uterine activity with the use of external or internal transducers. IA is another method for assessing the FHR during labor, using either a fetoscope or a hand-held ultrasound device (doppler) or the ultrasound transducer of a fetal monitor (Blix et al., 2019).

In an effort to provide more birthing options for eligible patients, the University of Pittsburgh Medical Center Magee-Womens Hospital (UPMC Magee) formalized the practice of

IA for low-risk patients admitted for labor by developing a new protocol. As a tertiary referral center, UPMC Magee holds a high standard for evidence-based practice with regularly updated policies and procedures (UPMC, 2021). Adequately educating nurses on this new protocol is pertinent to ensuring successful implementation and documentation (Bulfone et at., 2020; Heelan-Fancher et al., 2019), providing better healthcare outcomes.

2.0 Review of Literature

A positive sense of self-efficacy is achieved by understanding and experience and can influence one's learning and professional development (Garner et al., 2018). Self-efficacy is conceptualized by four domains: performance experiences, observational learning, verbal persuasion, and emotional status (Bandura, 1997). Performance experiences refer to past success or failure when practicing a desired skill (Van der Bijl & Shortridge-Baggett, 2001). Observational learning occurs with seeing others successfully perform the desired task (Van der Bijl & Shortridge-Baggett, 2001). Verbal persuasion refers to applying instructions, suggestions, and advice to improve the performance of a task or skill (Van der Bijl & Shortridge-Baggett, 2001). Lastly, the domain of emotional status, also referred to as physiological information, references how different mental and physical states of the human body can influence a person's estimation of his or her capability to perform a specific task. All domains play an important role in how a person attains self-efficacy (Van der Bijl & Shortridge-Baggett, 2001).

Education is a method to increase self-efficacy. Both undergraduates nursing students and nurse educators showed an increase in total self-efficacy as a result of education (Li et. al, 2019; Garner et. al, 2018). Nursing education promotes the ability to translate research into nursing practice (Heelan-Fancher et. al, 2019). To implement IA correctly, nurses need to be educated about the procedure. After an hour-long education session, a 12% increase occurred in the use of IA by nurses during labor (Maude et al., 2014). This increase in the use of IA complies with current evidence-based guidelines.

A higher self-efficacy in nurses is linked to an increase in clinical work performance and the implementation of IA (Cheraghi et al., 2009; Maude et al., 2014). Ongoing education is

extremely important to bridge self-efficacy and clinical skills. For example, when nurses were paid time off to attend conferences, this education was the strongest indicator of reducing perceptions of barriers to research utilization (Heelan-Fancher et al., 2019). The Association of Women's Health, Obstetric, and Neonatal nurses (2018) recommended ongoing education and periodic validation of knowledge and competence for nurses to prepare nurses for the use of IA.

There are tools to assess self-efficacy in nursing. Bulfone et at. (2020) developed and tested the Academic Nurse Self-Efficacy scale, which focused on nursing students during a three-year academic education program during prior to the start of their education and at the end of each year. This scale was both reliable and valid in measuring overall self-efficacy. A confirmatory factor analysis found a good fit and the reported Cronbach's alpha was 0.72–0.83 (Bulfone et al., 2020). Cheraghi et al. (2009) developed and tested the Self-Efficacy in Clinical Performance (SECP) scale for nursing students, focusing on the intervention of education in learning a clinical task. A factor analysis of questions grouped by nursing process components of assessment, diagnosis, planning, implementation was evaluated in relation to self-efficacy. The overall scale reported a Cronbach's alpha of 0.96 and a test–retest reliability with a 2-week time interval of $r = 0.94$. In addition, concurrent validity was $r= 0.73$ ($p= 0.01$).

IA assesses the FHR intermittently by auscultation during specific intervals of time in correspondence to the stage of labor. For example, the further along labor has progressed, the more frequently IA is to occur (American College of Nurse-Midwives, 2015). Uterine activity is assessed by palpation when using IA. When compared to IA, EFM has been associated with increased operative delivery without the benefit of a reduction in adverse fetal outcomes (American College of Obstetricians and Gynecologists, 2021). There are abundant benefits to IA for low-risk birthing patients. One major benefit is decreased rates of cesarean sections (Devane

et al., 2017). Devane et al. (2017) found a risk ratio of 1.2 (95% confidence interval = 1.00, 1.44) with continuous fetal monitoring verse IA. A meta-analysis synthesizing the results of randomized clinical trials, found that IA is associated with a decrease in the use of both vacuum and forceps during vaginal delivery (ACOG, 2009). IA allows for increased mobility of the mother, which has been associated with fewer labor complications and faster recovery from birth (Burelle, 2016). IA also benefits labor by being appliable during hydrotherapy, which increases comfort, and for alternative laboring positions (Burelle, 2016). IA is associated with a decrease in the use of analgesia and anesthesia, which causes less laboring complications. Epidural specifically, is associated to longer second labor stages, more frequent oxytocin augmentation, and maternal fever (Leighton & Halpern, 2002). IA is more patient centered because IA allows nurses to focus on the mother rather than the technology attached to her, which increases patient satisfaction (Burelle, 2016).

3.0 Purpose

The purpose of this study was to investigate the effect of education on self-efficacy with IA. Aim one was to develop a questionnaire to evaluate nurse's self-efficacy with IA. Aim two was to evaluate responses to the questionnaire items for changes pre- and post-education on a new protocol for IA.

4.0 Methods

4.1 Sample and Setting

Approval for this project was obtained through the UPMC Wolff Center. This was an observational study using a convenience sample of nurses attending a required labor and delivery unit orientation class for fetal monitoring.

4.2 Procedure

Demographic and self-efficacy questionnaires were developed (Appendix A). The questionnaire was informed by eight self-efficacy scales. Eleven Likert rated items for this study evaluated self-efficacy in relation to clinical performance of IA. A study identifier number was used to label each respondent's pre- and post-education questionnaires so that no personal identifiers were collected. The nurses first filled out the demographic items and self-efficacy questionnaire prior to the fetal monitoring class. Questionnaires were collected by the student investigator. The nurses attended the education session which was lecture format. The eight-hour session on EFM included one hour about IA. Content included what IA is, how to implement IA according to the new IA protocol, and the advantages and disadvantages of IA (Zabielski, 2022). The UPMC Magee protocol details eligibility of for IA, equipment required, the procedure for implementing IA, the frequency of palpation and auscultation, interpretations of auscultation findings, interventions, circumstances to discontinue IA, required documentation, and personnel

qualified to perform IA (UPMC Magee-Womens Hospital, 2020). The nurses could ask questions after the conclusion of the presentation. Following the education session, the nurses filled out the self-efficacy questionnaire again without seeing their prior responses. Responses were confidential, and not shared with the nurse educator.

The dependent study variable was defined as the self-efficacy of the nurses. More specifically, this study investigated the change in self-efficacy. The independent variable was the education provided about IA.

4.3 Analysis

The statistical analyses conducted included descriptive statistics (item distributions), item-to-item correlations, internal consistency reliability (Cronbach's alpha), and a non-parametric t-test, to assess differences following the educational intervention. The item distributions evaluated the difference between pre- and post-education responses. The correlation matrix reported the internal reliability of the instrument and had a defined acceptable of 0.6-0.8. The correlation matrix was conducted to evaluate the association of items within each domain. A Cronbach's alpha reported the internal consistency reliability of the instrument. These psychometric analyses only included the pre-education responses of all respondents. To assess post-education differences, a non-parametric t-test (Wilcoxon signed-rank test) was performed. This was completed at the item level with an alpha set to 0.005. A non-parametric t-test was used because the data collected was ordinal date and not normally distributed which would not satisfy the requirements for a parametric t-test. The data was analyzed using SPSS 28.0.1.0.

5.0 Results

5.1 Demographics

The total number of survey participants was 43 nurses. All were newly hired to the birthing unit. The sample consisted mostly of recently graduated nurses who predominantly had 0-10 years' experience as a nurse and 0-10 years' experience in the labor and delivery unit. There was almost an even split between Bachelor of Science in Nursing (BSN) educated and Associate Degree in Nursing/Nursing Diploma (AD/ND) educated participants. Participants' ages ranged from 18-60+ with most being 18-28 years old.

Table 1: Demographics of the Sample

Demographic	Response Distribution n=43 (100%)	Response Distribution n=43 (100%)	Response Distribution n=43 (100%)	Response Distribution n=43 (100%)	Response Distribution n=43 (100%)
What is your age (in years)?	18-28 n=31 (72%)	29-39 n=9 (21%)	40-49 n=0 (0%)	50-59 n=2 (5%)	60+ n=1 (2%)
What is your nursing education?	ADN/Nursing Diploma n=18 (42%)	BSN n=22 (51%)	Advanced Degrees in Nursing n=3 (7%)		
How many years have you worked in Labor and Delivery?	0-10 n=40 (93%)	11-20 n=0 (0%)	21-30 n=2 (5%)	31-40 n=0 (0%)	41+ n=1 (2%)

5.2 Distribution of Responses

The frequency distribution of the responses showed neither large floor nor ceiling effects (Table 2). Missing data was low with two instances when a numeric number from the scale was not recorded in the responses for a single item. The pre-education results indicated that less than 50 percent of the sample chose agree or strongly on any of the 11 items (Figure 1). After the education session, most nurses agreed or strongly agreed on seven of the items (n=22, 51%) (Figure 1). The pre-education item with the highest occurrence of agreed/strongly agreed was item 4 (n=20, 47%), "I am willing to implement intermittent auscultation," and post-education responses to item 4 increased further to n=31 (72%) (Table 2). The item with least agreement (strongly disagree/disagree) pre-education was item 6 (n=31, 72%), "I can explain each nursing intervention related to intermittent auscultation to patient before carrying it out." After the intervention, item 6 responses shifted towards agreed/strongly agreed (n=29, 68%). The item that had the greatest change post-education session was item 1, "I have sufficient knowledge of what intermittent auscultation is". The proportion of agree/strongly agree changed by n=33(77%), followed by item 3, "I am confident that I can collect subjective data related to patient eligibility for intermittent auscultation" (n=28, 65%) (Table 2).

Table 2: Disctribution and Changes in Responses

Item	Response	Pre n=43 (100 %)	Post n=43 (100 %)	p-value
1.I have sufficient knowledge of what intermittent auscultation is.	strongly agree (5)	n=2 (5%)	n=20 (47%)	<0.001
	agree (4)	n=5 (12%)	n=20 (47%)	
	neutral (3)	n=14 (33%)	n=2 (5%)	
	disagree (2)	n=12 (28%)	n=1 (2%)	
	strongly disagree (1)	n=10 (23%)	n=0 (0%)	
2.The positives of intermittent auscultation outweigh the negative consequences	strongly agree (5)	n=4 (9%)	n=6 (14%)	0.34
	agree (4)	n=10 (23%)	n=16 (37%)	
	neutral (3),	n=23 (53%)	n=13 (30%)	
	disagree (2),	n=4 (9%)	n=6 (14%)	
	strongly disagree (1)	n=2 (5%)	n=2 (5%)	
3.I am confident that I can collect subjective data related to patient eligibility for intermittent auscultation.	strongly agree (5)	n=1 (2%)	n=9 (21%)	<0.001
	agree (4)	n=5 (12%)	n=25 (58%)	
	neutral (3)	n=16 (37%)	n=6 (14%)	
	disagree (2)	n=13 (30%)	n=2 (5%)	
	strongly disagree (1)	n=8 (19%)	n=1 (2%)	

Table 2: Disctribution and Changes in Responses (continued)

4. I am willing to implement intermittent auscultation	strongly agree (5)	n=11 (26%)	n=12 (28%)	0.16
	agree (4)	n=9 (21%)	n=19 (44%)	
	neutral (3),	n=16 (37%)	n=6 (14%)	
	disagree (2),	n=6 (14%)	n=4 (9%)	
	strongly disagree (1)	n=1 (2%)	n=2 (5%)	
5. I have the knowledge to implement intermittent auscultation	strongly agree (5)	n=2 (5%)	n=10 (23%)	<0.001
	agree (4)	n=6 (14%)	n=20 (47%)	
	neutral (3)	n=10 (23%)	n=10 (23%)	
	disagree (2)	n=13 (30%)	n=2 (5%)	
	strongly disagree (1)	n=12 (28%)	n=1 (2%)	
6. I can explain each nursing intervention related to intermittent auscultation to patient before carrying it out	strongly agree (5)	n=2 (5%)	n=8 (19%)	<0.001
	agree (4)	n=3 (7%)	n=21 (49%)	
	neutral (3)	n=7 (16%)	n=12 (28%)	
	disagree (2)	n=21 (49%)	n=1 (2%)	
	strongly disagree (1)	n=10 (23%)	n=1 (2%)	
7. I am confident in implementing intermittent auscultation.	strongly agree (5)	n=2 (5%)	n=4 (9%)	<0.001
	agree (4)	n=5 (12%)	n=19 (44%)	
	neutral (3)	n=11 (26%)	n=13 (30%)	

Table 2: Disctribution and Changes in Responses (continued)

	disagree (2)	n=13 (30%)	n=5 (11%)	
	strongly disagree (1)	n=12 (28%)	n=2 (5%)	
8. I have enough support in my workplace to implement intermittent auscultation	strongly agree (5)	n=6 (14%)	n=8 (19%)	0.37
	agree (4)	n=11 (26%)	n=10 (23%)	
	neutral (3)	n=12 (28%)	n=14 (33%)	
	disagree (2)	n=8 (19%)	n=6 (14%)	
	strongly disagree (1)	n=6 (14%)	n=5 (12%)	
9. Intermittent auscultation is feasible in my hospital	strongly agree (5)	n=1 (2%)	n=4 (9%)	0.12
	agree (4)	n=9 (21%)	n=14 (33%)	
	neutral (3)	n=12 (28%)	n=8 (19%)	
	disagree (2)	n=13 (30%)	n=6 (14%)	
	strongly disagree (1)	n=8 (57%)	n=11 (26%)	
10. I know how to appropriately document intermittent auscultation	strongly agree (5)	n=1 (2%)	n=3 (7%)	<0.001
	agree (4)	n=6 (14%)	n=17 (40%)	
	neutral (3)	n=7 (16%)	n=17 (40%)	
	disagree (2)	n=1 (2%)	n=5 (12%)	
	strongly disagree (1)	n=15 (35%)	n=1 (2%)	
11. When facing difficulties in intermittent auscultation, I am certain	strongly agree (5)	n=1 (2%)	n=5 (12%)	<0.001

Table 2: Disctribution and Changes in Responses (continued)

that I will accomplish them.				
	agree (4)	n=7 (16%)	n=14 (33%)	
	neutral (3)	n=20 (47%)	n=19 (44%)	
	disagree (2)	n=10 (23%)	n=3 (7%)	
	strongly disagree (1)	n=5 (12%)	n=2 (5%)	

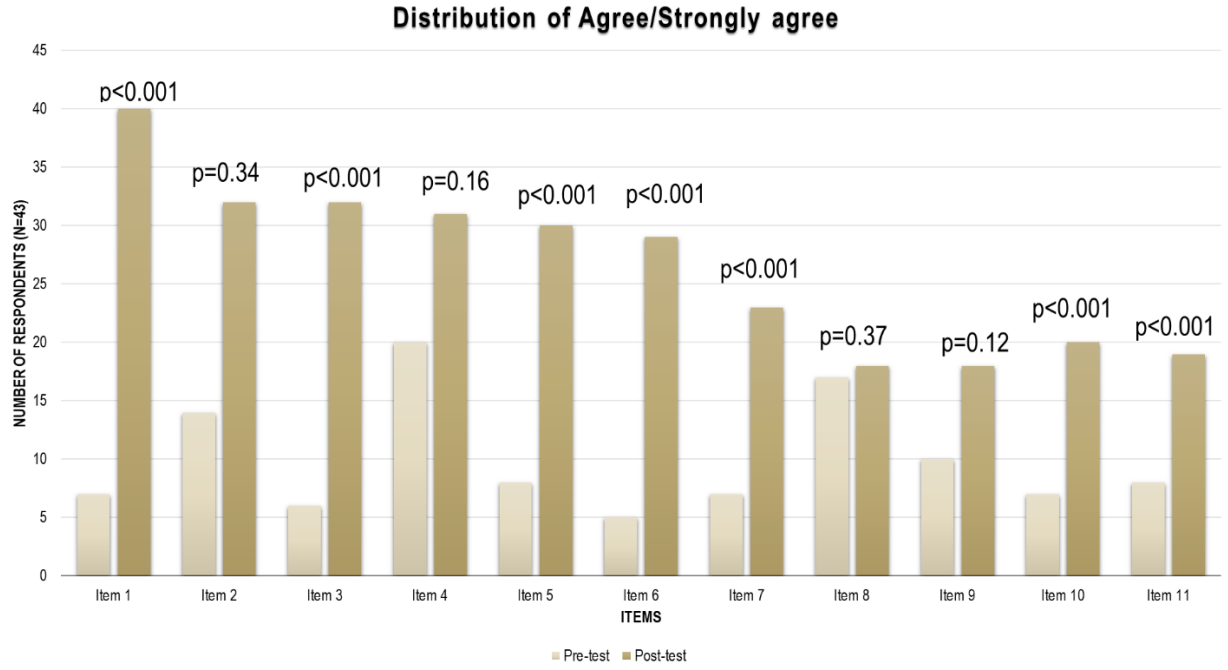


Figure 1: Ditributions of Responses

5.3 Correlation Matrix

In 11 instances, items reported an acceptable correlation value in the correlation matrix (0.6-0.8). Four instances reported about 0.8 and there were 32 instances below 0.6 (Table 3).

Observational learning included five items. All the items correlated well (within 0.6-0.8) except for item 2 (Table 4). The items in performance experiences were not highly correlated (0.25). Emotional status items 11 and 7 were highly correlated (0.61), but not with item 4. The verbal persuasion domain included item 8 which correlated with item 9 (0.63), which is in the performance experiences domain (Table 4).

Table 3: Distribution of Corrlation Matrix Values

Correlation Range	Number of Instances (n=43)
<0.3	9
0.3-0.49	23
0.5-0.59	8
0.6-0.8	11
>0.8	4

Table 4: Item Association by Domains

		Correlation with item									
Domain of Bandura's Self-efficacy Theory	**Item**	**2**	**5**	**6**	**10**	**3**	**9**	**4**	**7**	**11**	**8**
Observational Learning	1.I have sufficient knowledge of what intermittent auscultation is.	0.30	0.78	0.67	0.67	0.63	0.33	0.32	0.75	0.58	0.33
Observational Learning	2. The positives of intermittent auscultation outweigh the negative consequences.		0.29	0.16	0.28	0.34	0.42	0.54	0.31	0.32	0.46
Observational Learning	5.I have the knowledge to implement intermittent auscultation.			0.81	0.79	0.60	0.27	0.36	0.85	0.58	0.29

Table 4: Item Association by Domains (continued)

Observational Learning	6.I can explain each nursing intervention related to intermittent auscultation to patient before carrying it out.				0.72	0.58	0.21	0.23	0.85	0.47	0.31
Observational Learning	10. I know how to appropriately document intermittent auscultation.					0.45	0.48	0.32	0.82	0.54	0.36
Performance experiences	3. I am confident that I can collect subjective data related to patient eligibility for intermittent auscultation.						0.25	0.12	0.55	0.49	0.35
Performance experiences	9. Intermittent auscultation is feasible in my hospital.							0.42	0.38	0.62	0.63
Emotional status	4. I am willing to implement intermittent auscultation.								0.42	0.46	0.55
Emotional status	7. I am confident in implementing intermittent auscultation.									0.61	0.40
Emotional status	11. When facing difficulties in intermittent auscultation, I am certain that I will accomplish them.										0.52
Verbal Persuasion	8.I have enough support in my workplace to implement intermittent auscultation.										

5.4 Instrument Analysis

The reported Cronbach's alpha for all 11 items was 0.91. The related-samples Wilcoxon signed rank test demonstrated seven of 11 items with statistically significant differences post-education (Table 2).

6.0 Discussion

Self-efficacy in nurses is important to clinical competency (Cheraghi et al., 2009). One method to increase self-efficacy is education (Bulfone et al., 2020). This study investigated the effect of education about a new protocol on nurses' self-efficacy conducting IA using an investigator-developed questionnaire. The Bandura domains of self-efficacy consist of performance experiences, observational learning, verbal persuasion, emotional status (Bandura, 1997). All four domains relate to a different source of self-efficacy (Bandura, 1977). The questionnaire demonstrated good internal consistency and appears to have reliably measured the construct of self-efficacy with IA. The pre-education distributions (Table 2, Figure 1) showed a lack of agreement among the nurses' responses to the items. These differences allowed this investigation to assess change in response to education and a change in self-efficacy with IA.

There were five items in the observational learning domain of our questionnaire (Table 4). Observational learning is defined as seeing others perform a task successfully (Van der Bijl & Shortridge-Baggett, 2001), which is expected to build self-efficacy through social modeling processes (Bandura, 1997; Capa-Aydin et. al, 2018). The items in this domain referred to sufficient knowledge of IA (item 1), nurse's perception about the positives outweighing the negatives of IA (item 2), knowledge to implement IA (item 5), ability to explain IA before conducting the procedure (item 6), and knowledge about how to document IA (item 10) (Table 4). All items increased post-education (Table 2). Education has been linked with an increase in documentation of IA and knowledge of IA (Maude et. al, 2014; Romano & Buxton, 2020), but this study found that education also increased perception of the implementation of IA, knowledge to implements, and ability to explain IA.

The performance experiences domain included two items in the questionnaire (Table 4). Performance experiences refers to past success or failure when performing a desired skill (Van der Bijl & Shortridge-Baggett, 2001). The education session increased respondents' confidence to assess patient eligibility for IA (Item 3). In contrast, there was no change in responses to feasibility of IA in the hospital (Item 9) (Table 2). This reinforced that education can increase one's perception of ability to perform a clinical task (Li et. al, 2019; Garner et. al, 2018). This study also reported a low correlation value between confidence to collect subjective data related to patient eligibility for IA and feasibility of IA on the unit, showing that the items did not correlate well. This makes sense because feasibility of a task is not a factor of confidence (Grassley & Tivis, 2020).

The emotional status domain contains three items (Table 4). Emotional status refers to how mental and physical states of the body can influence a person's estimation of ability to perform a specific behavior (Van der Bijl & Shortridge-Baggett, 2001). Perceived stress is a threat to self-efficacy (Van der Bijl & Shortridge-Baggett, 2001). Education increased confidence in implementing IA (item 7) and certainty when facing difficulties with IA (item 11). Willingness to implement IA (item 4) was not affected by education. Confidence to implement IA and confidence when facing difficulties were highly correlated (Table 2). The low correlation between willingness and confidence was not expected because others had shown that a nurse's willingness to implement a clinical task is an aspect of confidence (Grassley & Tivis, 2020).

Verbal persuasion contained one item (Table 4). Verbal persuasion refers to professionals providing instructions, suggestions, and advice to the individual learning a new task (Van der Bijl & Shortridge-Baggett, 2001). Education did not affect the nurses' perceived support from the unit to implement IA (Item 8) (Table 2). Nurse's perceived support from the unit (item 8) highly

correlated with respondents' perceived feasibility of IA in the hospital (Item 9). This correlation was not expected but is consistent with current literature. Patey et al., (2017) found that hospital policies and lack of team member support were often the main barrier nurses faced when practicing fetal surveillance.

6.1 Recommendations

This study found that lecture-based education on IA may be sufficient to increase nurse's self-efficacy with IA in each of its domains. To strengthen the IA education sessions, different learning styles could be incorporated. Using different learning styles can allow the nurses to develop more critical thinking skills (Arunachalam, 2021). For example, simulation or a video demonstrating the entire process of IA implementation could be incorporated. This could then affect more than one domain by having the nurses learn in different ways (Baird et. al, 2015). Simulation based learning is effective in improving nursing students' perceived competence, self-efficacy, and learning satisfaction. Multiple instructional strategies are recommended to achieve optimal learning outcomes (Hung et. al, 2021).

6.2 Limitations

There are limitations to this study. One limitation is the sample size. This investigation was conducted during the COVID-19 pandemic, when most of the fetal monitoring education classes were postponed or altered to accommodate the mitigation circumstances. This led to a small

sample size. The demographics collected on the sample were broad. If one were to focus on smaller ranges of each demographic variable, then more information about the sample could be analyzed. Since there was a limited sample size, a factor analysis for the questionnaire was not feasible. An estimated number of participants needed for factor analysis in instrument development is five to ten per item (Pearson & Mundform, 2010). The design of our study inherently included threats to validity. Observational studies do not include a control group, so that test/retest reliability of the tool could not be assessed. Another limitation was the timing of responses to the questionnaire. The time between the pre-education responses and the post-education responses was between three to four hours. The respondents could have remembered the questions and prior answers, potentially affecting post-education responses.

6.3 Future Research

A factor analysis should be conducted. This would produce a scale that focuses on IA education and the domains of self-efficacy. An investigation into the actual implementation of IA, following the education session should be explored. One could then examine how education influences implementation. For future research, the relationship between the steps of the nursing process and the domains of self-efficacy should be explored (Cheragi et al., 2009) (Appendix A). This would connect clinical performance to education.

7.0 Conclusion

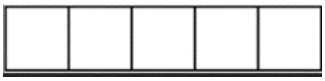
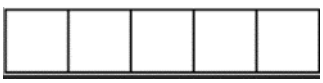
This study investigated the effect of IA education self-efficacy in nurses. This study showed that the instrument was reliable, and that education changed responses in a positive way. Overall, lecture style education enhanced observational learning, while leaving room for growth in performance experiences, verbal persuasion, and emotional status domains. Lecture alone did not affect perception of feasibility of IA, nurses' willingness to implement IA or support for IA from the unit. To maximize the effectiveness of education, teaching with multiple methods could reinforce learning in different methods that could take domains of self-efficacy into account. We found that lecture sessions increased nurses' self-efficacy with IA. Future research should investigate the relationship between the nursing process with IA and domains of self-efficacy as nurses perform clinical IA for optimal mother-baby birth outcomes.

Appendix A Investigator- Developed Questionnaire of Nurse's Self-Efficacy with IA

What is your age?	18-28 ☐ 29-39 ☐ 40-49 ☐ 50-59 ☐ 60+ ☐
What is your nursing education?	ADN/Nursing diploma ☐ BSN ☐ Advanced degrees in nursing ☐
How many years have you worked in Labor and Delivery?	0-10 ☐ 11-20 ☐

	21-30 ☐ 31-40 ☐ 41+ ☐
How many years have you worked as a nurse?	0-10 ☐ 11-20 ☐ 21-30 ☐ 31-40 ☐ 41+ ☐

Domain of Self-Efficacy in the Nursing Process (Cheraghi et al., 2009)	Domain of Bandura Self-efficacy: Performance experiences, Observational Learning,	Item	Survey- using scale of strongly agree (5), agree (4), neutral (3), disagree (2), strongly disagree (1)	Citation

	Verbal Persuasion, Emotional status			
Assess the eligibility for intermittent auscultation	Observational Learning	1.I have sufficient knowledge of what intermittent auscultation is.	1 2 3 4 5 	(Romano & Buxton, 2020)
Evaluation	Observational Learning	2.The positives of intermittent auscultation outweigh the negative consequences.	1 2 3 4 5 	(Patey et al., 2017)
Assess the eligibility for intermittent auscultation	Performance experiences	3. I am confident that I can collect subjective data	1 2 3 4 5 	(Cheraghi et al., 2009)

		related to patient eligibility for intermittent auscultation.		
Diagnosis/planning	Emotional status	4. I am willing to implement intermittent auscultation.	1 2 3 4 5 	(Heelan-Fancher et al., 2019)
Diagnosis/planning	Observational Learning	5. I have the knowledge to implement intermittent auscultation.	1 2 3 4 5 	(Snelgrove-Clarke et al.,2015)
Diagnosis/planning	Observational Learning	6.I can explain each nursing intervention related to intermittent auscultation to patient before carrying it out.	1 2 3 4 5 	(Cheraghi et al., 2009)

Implementation	Emotional status	7. I am confident in implementing intermittent auscultation.	1 2 3 4 5	(Zamani-Alavijeh et al., 2019)
Implementation	Verbal Persuasion	8. I have enough support in my workplace to implement intermittent auscultation.	1 2 3 4 5	(Patey et al., 2017)
Implementation	Performance experiences	9. Intermittent auscultation is feasible in my hospital.	1 2 3 4 5	(Klassen, 2018)
Assess the eligibility for intermittent auscultation	Observational Learning	10. I know how to appropriately document intermittent auscultation.	1 2 3 4 5	(Miller, 2015)

Evaluation	Emotional status	11.When facing difficulties in intermittent auscultation, I am certain that I will accomplish them.	1 2 3 4 5 	(Cheraghi et al., 2009)

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