

ORIGINAL RESEARCH ARTICLE

A comparison of birth-fall protective apparatus with conventional setting on nursing students' self-efficacy and skill in simulated vaginal parturition: A randomized trial

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Abstract

Undergraduate nursing students must study and train on simulation before patient practices because of patient safety policy. Their most concerns were the inadvertent mistakes, particularly in obstetrical training, which had limited room for supervisors to assist them in any phase. As a result, their self-efficacy was one of the important factors that contributed to their learning success. This research was a randomized trial design in 120 nursing students who volunteered to improve their self-efficacy in vaginal birth training by applying birth-fall protective apparatus to conventional simulation settings. When compared to another intervention station, the educational self-efficacy score at the intervention station was statistically significantly higher. ($t = 7.33$, $p < .01$) Furthermore, this station's clinical performance ratings were higher than the conventional station's. ($t = 4.69$, $p < .01$) Most students were pleased with this safety apparatus and required to use it in their practices. (*Afr J Reprod Health* 2022; 26[1]: 24-35).

Keywords: Invention, patient safety, nursing, parturition, self efficacy

Résumé

Les étudiants en soins infirmiers de premier cycle doivent étudier et s'entraîner sur la simulation avant de pratiquer les patients en raison de la politique de sécurité des patients. Leurs principales préoccupations étaient les erreurs commises par inadvertance, en particulier dans la formation en obstétrique, qui laissait peu de place aux superviseurs pour les aider à n'importe quelle phase. Par conséquent, leur auto-efficacité était l'un des facteurs importants qui contribuaient à leur succès d'apprentissage. Cette recherche était une conception d'essai randomisé auprès de 120 étudiantes en soins infirmiers qui se sont portées volontaires pour améliorer leur auto-efficacité dans la formation à l'accouchement vaginal en appliquant un appareil de protection contre les chutes dans des contextes de simulation conventionnels. Par rapport à une autre station d'intervention, le score d'auto-efficacité éducative à la station d'intervention était statistiquement significativement plus élevé. ($t = 7,33$, $p < 0,01$) De plus, les cotes de performance clinique de cette station étaient supérieures à celles de la station conventionnelle. ($t = 4,69$, $p < 0,01$) La plupart des étudiants étaient satisfaits de cet appareil de sécurité et encouragés à l'utiliser dans leurs pratiques. (*Afr J Reprod Health* 2022; 26[1]: 24-35).

Mots-clés: Invention, sécurité des patients, soins infirmiers, parturition, auto-efficacité

Introduction

The safety of patients is currently the foremost important issue in clinical practice, especially in the case of obstetrics. Between 1975 and 2000, the incidence of medical malpractice among obstetricians increased almost fourfold that of other medical costs¹. In addition, the previous report showed that there were a few obstetrical approaches in reviews or assessments². Owing to malpractice lawsuits, many nurse practitioners made some mistakes. The latest study showed that the largest

proportion of malpractice lawsuits concerning nurse practices was about 70 percent³. One of the solutions was nursing education reform. The summary analysis of several randomized clinical trials of quality management approaches found that healthcare provider education could improve the safety of both maternal and childbirth⁴.

Despite ongoing improvements to the undergraduate nursing curriculum, some studies have found a shortage of perinatal care skills and knowledge among registered nurses, particularly newly graduated nurses⁵. The concept of “never for

the first time on patients" encouraged the incorporation of simulation learning in the nursing curriculum. Previous research concluded that this method could improve student performance and predicted that it would be comparable in clinical practice. But many healthcare workers still felt uncertain about the nursing skills of newly graduated nurses at work⁶. The systematic reviewed of randomized controlled trials on the effects of simulation training on the skills of nurses found that simulation learning to have a positive impact on nursing skills⁷. But there was limited confidence in the quality and size of the samples in the previous studies⁷. The authors could not conclude from this data that simulation learning would have a further positive effect on clinical practices. There could be other factors or information relevant to the quality of learning.

Recent studies on nursing students showed that the simulation method needed to be re-designed to follow the instructional curriculum and goals in order to improve the critical thinking and self-confidence of undergraduates⁸. The simulation environment was also the key element in improving the quality of simulation learning⁹. It not only made trainees feel safe, but it also helped them improve their skills. One of the safe environments is the effective equipment that keeps the patient safe. It also encourages healthcare workers to perform their duties with a high level of self-efficacy.

The safety setting of the equipment for the patients had to be addressed in order to make the simulation learning effective. This was the trigger point that pushed our research teams to add safety intervention to the conventional simulation platform. Before developing this protective equipment, the study team polled 200 nursing students who had previously been educated in the obstetrics and gynecology department at this institution and discovered that over 80% of them were nervous when assisting with vaginal delivery for the first time. In their parturition training, all students needed safer equipment than usual, especially newborn-falls protection. There was a tendency for accidental newborns to fall during the second stage of labor due to rapid infant expulsion and slippery gloves. To this end, our team worked to develop an apparatus to prevent babies from falling during the student's parturition training. This

apparatus was created under the concept of "patient safety" and therefore the design could be blunt, but strong enough to protect the baby from falling.

According to an invention that has never been used in humans before, the author planned to test it in a simulation trial and expected to get a direct effect on the self-efficacy and better clinical performance of nursing students. However, this invention was tested on medical students in the author's study and found to have a positive effect on their self-efficacy⁹.

Objectives

To compare birth-fall protective apparatus with the conventional setting on nursing students' self-efficacy and skills in simulated vaginal parturition.

Methods

Trial design

The study design was a randomized controlled trial. There were two simulation stations; intervention and convention. The simulation set up of both stations was the same pattern except for the intervention that added birth-fall apparatus. After participants were selected by eligibility criteria, they were randomly allocated to both stations.

Participants and eligibility criteria

The study started at the Medical Faculty of the University of Burapha in the academic year 2018 (July 2018 to July 2019). The study's population consisted of undergraduate nursing students in active undergraduate status. The eligibility criteria for inclusion were as follows: clinical level nursing students who had previously learned obstetrics and gynecology; no physical disability; no history of mental illness; and informed consent to be volunteers in this study. The exclusion criteria were the inability to participate in the study until the completion of the process or the unwillingness to be a volunteer. There were 300 undergraduates who met the criteria for inclusion.

Sample size

The sample size was calculated using G*Power program version 3.1.9.2 with input parameters as

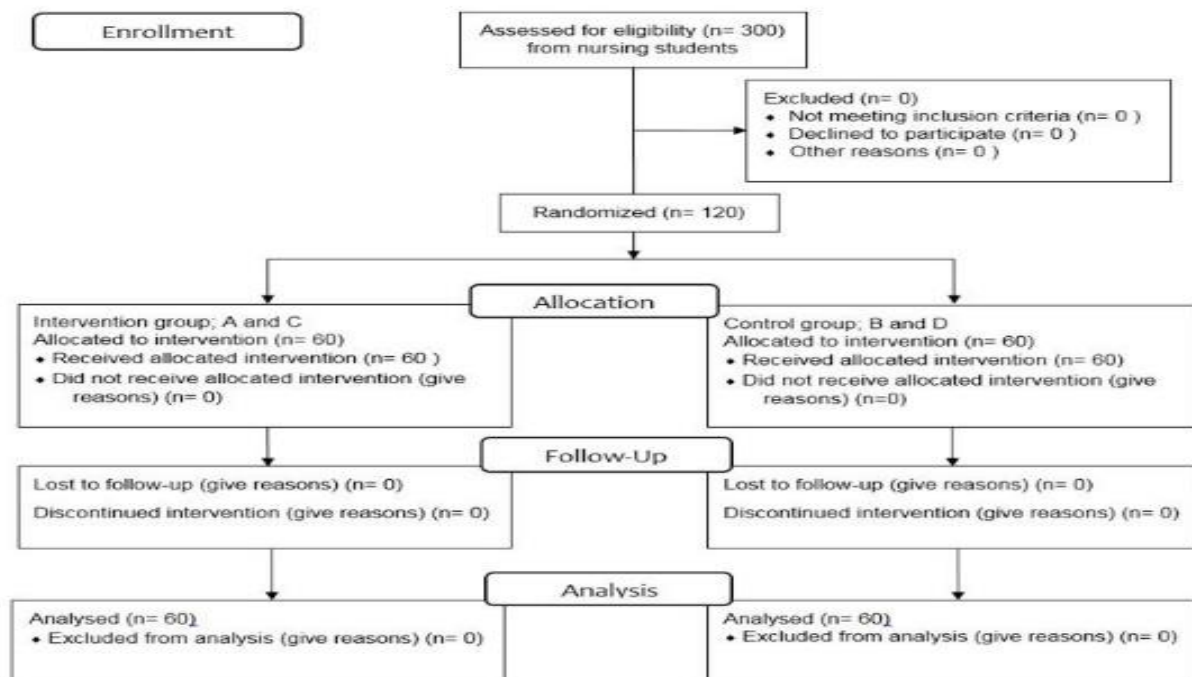


Figure 1. The diagram displayed the simulation trial processes among the participants. There were 120 nursing students assigned to four classes at random; intervention (A and C) and control groups (B and D). No discontinued intervention or loss of volunteer monitoring was observed

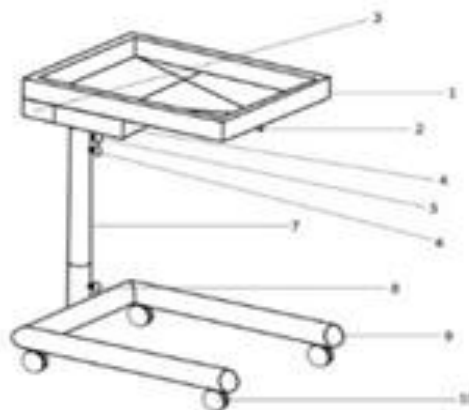


Figure 2 the newborn-fall prevention apparatus in 3 dimension illustration. There are two main parts. Part 1 is the baby tray [1] with hose connection [2]. Part 2 is the baby tray supporting which composes of rectangular box for baby support [4] and the single pillar [7] for adjustable height as required by screw-knobs. [5, 6, 8] The basement support is the U shape platform [9] with 4 wheels with break system. [10]

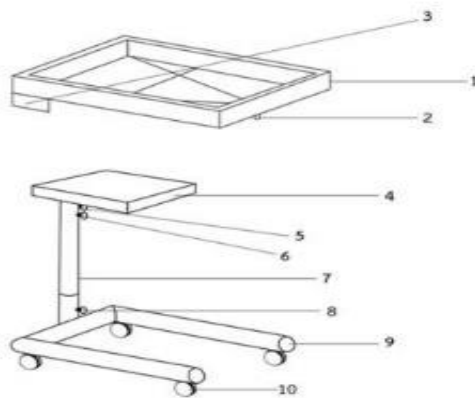


Figure 3 the newborn-fall prevention apparatus illustration of separation part in three dimension. The main part is raised edge rectangular baby tray [1] with drainage hose connection [2]. At the bottom of baby tray has two of half frame plates [3] for combination with the supporting box [4]. There is the single pillar [7] which height adjustable by screw-knobs [5, 6, 8] and the U shape platform [9] with 4 breaking-system wheels. [10]

follows: one tail, effect size = 0.5, alpha error probability = 0.05, and the power of test = 0.80. The sample size was at least 51 subjects. The author added 15% of the sample due to withdrawal events since most nursing students had to study clinical practices outside the campus. The total sample size we required was 117 subjects. We chose to recruit 120 samples for this study in order to properly control the experiment. We aimed to divide them evenly between the intervention and conventional groups using the Random Allocation Software version 2.0.

Randomization

The participants were randomized into four groups: A, B, C, and D. Each group was composed of 30 participants. Owing to time inadequacy, the experiment was split into two days. Groups A and B were evaluated on the first day, with groups C and D being tested on the second day. Groups A and C were tested at the intervention station, and groups B and D were tested at the conventional station. After the participants completed the trial, they were taken to another room to avoid meeting with other volunteers who had not yet taken the test. The trial phase flow chart is illustrated in Figure 1.

Interventions and measures

Before the study began, the research team briefed all participants on the procedure and trained

intervention groups on how to use birth-fall protective equipment. We gave them the opportunity to raise questions and explain their issues with trial procedures until they understood and were ready to act. Before the trial, all participants were asked to assess their stress on a visual analogue scale. After the experiment, they were asked to rate their stress, self-efficacy, and satisfaction with the simulation experience. During their acts, experts evaluated their clinical performance as well.

Intervention.

In order to test the efficacy of this birth-fall protective prototype, it was thus designed as an add-on intervention material for the conventional simulation setting. This invention was created with the concept of “*safety first*”, which was designed to follow through the learners’ preferences and clinical experts’ comments. There were three parts that could be separated manually with hands. The first part was a baby tray with a rectangular design and a drainage pour on the tray floor. A hose for tubing connection was located beneath the infant tray and could be used to more accurately monitor postpartum hemorrhage. The second part was a supporting tray, which could be connected to the first part with the half-frame locking. The last part was the mobile and secure function of this apparatus, consisting of a four-wheel drive-in station and a support baby tray stand. (Figures 2 and 3).

The Mechanical Engineering Test of Burapha University determined that this invention was strong enough to be used for newborn support. In addition, it has already been registered in the Thai intellectual property account in 2019.

Measures

There were four types of scales that were used for measurement in this study.

The Educational Self-Efficacy Scale (ESS)

It was used as a method for measuring the self-confidence of these participants^{11,12}. This tool included five questions, each with a grade ranging from "Not at all confident = 1 point" to "Extremely confident = 5 points." The scale was derived from the Harvard-Panorama Student Perception Survey and aligned with Imperial College's best practices for structuring the entire questionnaire¹³. To apply to Thai nursing students, we requested linguistic consultants to modify this scale to Thai version and to evaluate it on 100 nursing students at another nursing school, measuring validity and reliability. The alpha values for Cronbach's alpha and Item Index-Objective Congruence (IOC) were 0.82 and 0.76, respectively. Originally, there was no cut-off level for this scale. It was preferred for comparing before and after learning or intervention.

Clinical performance assessment tool (CPAT)

The clinical skills of participants were assessed using the CPAT, consisting of a rating scale of 0 to 4 (dependent-novice-assisted-supervised-self-directed)¹⁴. This tool was developed by the University of North Carolina, Chapel Hill School of Nursing for the purpose of nursing students' competency evaluation before letting them go to practice in actual fieldwork. The mid-level or assisted-level of this rating tool, which was defined as "often demonstrates clinical skill at an adequate grade", was considered acceptable. It implied that these students would still require assistance or supervision in order to complete their skills.

We created a Thai version of CPAT, which was tested for validity and reliability by clinical professionals and 30 nursing students from another school. Cronbach's alpha and IOC were 0.80 and

0.70, respectively. In each station, three senior nurses from other regional hospitals evaluated the students' performance in this study. Prior to starting this trial, we informed all assessors about the research protocol. The researcher team set up a simulation room to conceal these assessors so that the participants did not know that these assessors had measured their clinical skill effectiveness.

Satisfaction with simulated experience scale (SSES)

All participants were asked to rate their satisfaction with this simulation test using a satisfaction scale that had previously been utilized in simulation learning research¹⁵⁻¹⁸. The modified SSES in Thai form was employed in this study. In a prior study, validity and reliability in Thai nursing students were determined to be 0.91 and 0.96, respectively¹⁹. This measure used a five-point Likert scale and included 18 items that investigated three aspects of the simulation experience: debriefing and reflection (9 items), clinical reasoning (5 items), and clinical learning (4 items). This evaluation was taken after they completed their trial. The average satisfaction score was interpreted as follows: 1.00-2.33 –low, 2.34-3.67 –medium, 3.68-5.00 –high.

Visual analogue scale (VAS) for stress level

The students' stress levels were visualized using the visual analogue scale (VAS) before and after practice. They were asked to rate themselves on a scale of 1 (Calm) to 10. (Too nervous). All participants were asked to make the X-maker on a graphical scale with a linear design ranging from 0 to 10 to express their sentiments.

We invited nursing students from other nursing schools to assist us in organizing this trial in order to conceal the identities of the investigators in order to eliminate the bias of teacher-student relationships.

Scenario and simulation setting

The following details were set for the case-scenario below.

"G2P1001, a 35-year-old woman, comes with labor pains to the emergency room. Her vital signs are normal and the vaginal examination reveal a

complete dilation of the cervix, rupture of the fetal membrane, and crowning of the head while she has uterine contractions. Please support her to complete the second stage of vaginal delivery”

The equipment set up at both simulation stations was the same, except for the innovation setting that included the safety equipment to protect the baby-fall during their testing. In order to achieve realism under simulation conditions, the 2800-gram baby mannequin was sprayed with shampoo mixed with water, and we placed an intermittent balloon pump above the mannequin to simulate the maternal labor force.

Furthermore, during this trial, the author invited two midwives to cheer her (mother mannequin) up and assist with simulation resetting after each participant finished testing. The time of the experiment was seven minutes for each station. The video recording was taken on both stations for review and feedback purposes after all participants completed this trial. This protocol was approved by all participants for this study. We assured all participants that the video files were only used to evaluate the informative feedback experiment's summary, and that these recording files were erased following the review process.

Data collection and analysis

General data on volunteers was collected through questionnaires and analyzed using descriptive statistics. Self-efficacy and clinical skills of all participants were measured using specific methods that were cited and compared using an independent t-test method. The views of the participants in this simulation trial were evaluated by SSES and analyzed by descriptive statistics and the independent t-test method. The stress levels at pretest and posttest were compared by paired t-test. The video recording files have been studied and evaluated by the research team.

At the end of the experiment, the researcher team met with all participants and offered an overall reflection of the professional perspectives on their simulated experiences. We expected that the students could understand more and take the beneficial messages from this participation.

Study outcomes

The purpose of this study was to improve the self-efficacy of vaginal birth skills of nursing undergraduates through safer equipment add-on training. We expected to reduce participants' anxiety during training and increase their satisfaction by using safety training equipment that addressed their concerns.

Results

This trial was attended by 20 male students and 100 female students. Around half of them were studying in the third year. The average age was 21.47 ± 0.72 years. Their average GPX was 2.81 ± 0.49 and the average parturition aid for their training in the past was 5.4 ± 1.43 . They confirmed that they had never seen a newborn fall during their learning; however, they admitted that there were five near-missing newborn fall events during their training. There was no statistically significant difference in gender ($X^2 = 0.48$, $p = 0.923$) and the level of study ($X^2 = 0.90$, $p = 0.825$) between all groups. There was also no statistically significant difference between all groups in the number of previous learning cases ($F = 1.88$, $p = 0.136$), age ($F = 1.22$, $p = 0.306$) and GPX ($F = 0.68$, $p = 0.568$). (Table 1)

Educational self-efficacy scores between the two stations showed statistically significant differences ($t = 7.33$, $p \leq 0.01$). (Table 2) The subgroup analysis of A&B and C& D groups revealed a statistically significant difference ($t_{AB} = 6.84$, $p \leq 0.01$ and $t_{CD} = 3.88$, $p \leq 0.01$). According to the expert assessors on volunteer performance, the increase in CPAT scores at the inventive station was more than conventional statistical significance, whether total ($t = 4.69$, $p \leq 0.01$). (Table 3) The subgroup analysis of A&B and C& D groups showed a statistically significant difference ($t_{AB} = 2.15$, $p \leq 0.01$; $t_{CD} = 4.64$, $p \leq 0.01$).

The difference in SSES scores between the two groups was statistically significant ($t = 5.86$, $p \leq 0.01$). It differed in clinical reasoning and clinical learning ($t = 3.87$, $p \leq 0.01$ and $t = 6.15$, $p \leq 0.01$, respectively). The intervention and control groups' average SSES scores were both in the high range.

Table 1: The general data of nursing students volunteers in the vaginal birth simulation trials

Topics		Group				X ²	p	N	%	
		A	B	C	D					
Gender						0.48	0.923			
Male		6	4	5	5			20	16.67	
Female		24	26	25	25			100	83.33	
Study level						0.90	0.825			
3 th		17	14	14	16			61	50.83	
4 th		13	16	16	14			59	49.17	
	Min-Max					F	p	Mean	SD.	
Number of case ever delivered		4-8	5.40	5.10	5.07	4.93	1.88	0.136	5.40	1.43
Age		20-24	21.27	21.53	21.60	21.50	1.22	0.306	21.47	0.72
GPX		2.00-3.84	2.91	2.81	2.76	2.75	0.68	0.568	2.81	0.49

Table 2: Comparison of nursing students' ESS scores between inventive and traditional simulation

ESS	Simulation trial		Mean	N	SD.	SE.	
(A&C)-(B&D)	A&C		16.03	60	1.65	0.21	
	B&D		13.75	60	1.76	0.23	
	t-test for quality of means						
	Mean	SE.	95% confidence interval of differences		t	df	Sig
			Lower	Upper			(2- tailed)
	2.28	0.31	1.67	2.90	7.33	118	<0.01

Levene's test; F =1.64, p = 0.202, alpha level = 0.05

Table 3: Comparison of nursing students' CPAT scores between inventive and traditional simulation

CPAT	Simulation trial		Mean	N	SD.	SE.	
(A&C)-(B&D)	A&C		2.44	60	0.51	0.07	
	B&D		2.08	60	0.29	0.04	
	t-test for quality of means						
	Mean	SE.	95% confidence interval of differences		t	df	Sig
			Lower	Upper			(2- tailed)
	0.36	0.08	0.21	0.51	4.69	93.86	<0.01

Levene's test; F =21.64, p = 0.00, alpha level = 0.05

Table 4: Comparison of satisfaction with simulated experience scale (SSES) between intervention and convention groups

SSES							
Evaluation area	Group	Mean	SD.	SE.			
Debriefing and reflection	Intervention	3.87	0.21	0.03			
	Convention	3.93	0.25	0.03			
Clinical reasoning	Intervention	3.98	0.36	0.05			
	Convention	3.73	0.34	0.04			
Clinical learning	Intervention	3.92	0.39	0.05			
	Convention	3.52	0.32	0.04			
Total	Intervention	3.92	0.20	0.03			
	Convention	3.73	0.16	0.02			
(A&C)-(B&D)	t-test for quality of means						
	Mean	SE.	95% confidence interval of differences		t	df	Sig (2- tailed)
			Lower	Upper			
Debriefing and reflection	-0.06	0.04	-0.15	0.02	-1.52	118	0.131
Clinical reasoning	0.25	0.06	0.12	0.38	3.87	118	≤0.01
Clinical learning	0.40	0.07	0.27	0.53	6.15	118	≤0.01
Total	0.20	0.03	0.13	0.26	5.86	118	≤0.01

Table 5: Comparison of pretest and posttest visual analogue scale of stress intensity of participants

VAS of Stress									
	Test		Mean	SD.	SE.				
All Groups	Posttest		5.24	0.84	0.08				
	Pretest		6.07	0.76	0.07				
Paired differences									
	Mean	SD.	95% confidence interval	of t	df	Sig (2- tailed)			
			Lower	Upper					
Posttest-Pretest	-0.83	0.90	-0.99	-0.66		-9.99	119	≤0.01	
Posttest VAS									
	Group		Mean.	SD.	SE				
Posttest VAS scores	Intervention		5.15	0.86	0.11				
	Convention		5.33	0.82	0.11				
VAS posttest comparison	t-test for quality of means								
	Mean	SE.	95% confidence interval	of t	df	Sig (2- tailed)			
			Lower	Upper					
Intervention-Convention	-0.18	0.15	-0.49	0.12		-1.20	118	0.234	

Participants in the intervention group were statistically more satisfied with the simulation test than those in the conventional group. ($t=5.86$, $p\leq 0.01$). (Table 4)

At posttest values, all participants had a statistically significant decrease in VAS scores ($t=-9.99$, $p\leq 0.01$). When the posttest VAS scores were analyzed, there was no difference between the intervention and convention groups. ($t=-1.20$, $p=0.234$). (Table 5)

According to video file analysis, three infant mannequins fell in both stations throughout the trials, with six near-misses in the conventional station and four near-misses in the other station. When the mannequin fell to the floor, it forced those participants to take a break from the trial. Some students sat on the floor, looking for assistance. All participants were satisfied with the safety equipment and hoped that new trainees would have the opportunity to use it in vaginal birth training. They stated that this training problem had been neglected and ignored for a long time. They praised the researchers who built this safety invention because it helped them relieve their stress in training.

Discussion

In a simulation context, this study focused on the impact of birth-fall protective equipment on nursing students' self-efficacy and clinical competence in simulated birth assisting. The outcomes of a

randomized experiment comparing intervention and conventional groups. When compared to the conventional group, it appeared that this safety intervention had a significant favorable influence on undergraduates' self-efficacy. Furthermore, this safety intervention had a positive impact on nursing students' birth assistance skills. The majority of participants, particularly those in the intervention group, were satisfied with the simulation test as defined by the SSES score. After completing the testing, the VAS stress scores of the majority of participants decreased. During the experiment, there were also occurrences of infant mannequins falling and near-misses.

These findings were similar to those of a previous study, which found that implementing obstetrical simulation in an undergraduate nursing program improved students' self-efficacy and competence²⁰. Most clinicians now accept that simulation learning is one of the most powerful pragmatic tools in developing clinical skills in undergraduates²¹. Simulation-based nursing education has been shown to be beneficial in many learning domains. The educational results, on the other hand, were not related to the degree of fidelity of the simulation setting²². It was up to the specifics of the simulation environment and methods to determine whether the learners' competency gap could be bridged. Most simulation managers pay little attention to the mental emotions of their trainees, such as anxiety, fear of making errors, and excitement. As a result, the students' worry has

remained unabated to this day. In fact, the learner's mental condition is important to academic success, particularly in the first practical session. A good learning outcome can be achieved if a simulation learning arrangement takes into account these learner characteristics.

This invention was inspired by the concerns of the learners. The primary goal of this apparatus was to prevent newborns from falling during vaginal delivery. It may also be used to measure postpartum blood loss via a drainage line at the bottom of the baby tray, making it easier to estimate postpartum bleeding than traditional approaches. It can also be used as a table to place surgical tools during perineum wound repair, making it simpler to get the surgical instrument in front of the user than a standard side table. Because these functions met the needs of the participants, the intervention group's satisfaction level was higher than the control groups.

When we examined the specifics of this study's satisfaction score, we discovered that the intervention group's mean ratings on three of the four questions were significantly higher than the control groups. These were the questions with varying scores: the simulation caused me to reflect on my clinical ability; the simulation helped me to apply what I learned from case study; and the simulation helped me to recognize my clinical strengths and weaknesses. In addition, there were three subtopics in the clinical reasoning part where the intervention group outscored the control group. These were the questions with varying scores: the simulation enabled me to demonstrate my clinical reasoning skills; the simulation helped me to recognize patient deterioration early; and this was a valuable learning experience. These findings could imply that they were related to the effect of the safety intervention add-on in the old simulation setting.

Our findings were consistent with previous research that demonstrated the value of safety self-efficacy in improving safety performance in nursing students²³. Furthermore, a recent study found that safety interventions increased nursing students' safety motivation and self-efficacy²⁴. Our study's results also contributed to Bandura's theory by demonstrating the impact of mastery experiences on learning motivation and self-efficacy despite the simulation setting²⁵. It could be explained that this

intervention addressed the participants' concerns and needs.

Stress could have an impact on a student's performance. One study found a moderate negative impact of stress on academic performance in medical students. In addition, there was a positive correlation between stress levels and the number of sources of stress²⁶. As a result, the study's management, which takes into account the learners' tension, assists in the growth of the learners' clinical skills. Preparatory clinical education is one approach that may make undergraduates feel less nervous. One research showed that this approach substantially decreased stress in the intervention group relative to the control group²⁷. Therefore, including this birth-fall protective apparatus in the conventional simulated setting could help these nursing students feel less anxious and stressed. Recent data found that psychological stress had an effect on clinical performance²⁸. The main success factor for achieving the study goals was the suitable educational interventions and innovations²².

This prototype was an educational innovation that was created to be simple and cost-effective to produce. The manufacturing cost ranges between \$500 and \$800 USD, depending on the material, and it can be used for at least ten years. It could be used in any formal hospital or field hospital because it was easy to use, mobile and did not require electricity. This prototype was developed under the safety principle, therefore; its architecture might be blunt and not updated. However, during this simulation trial, it was able to protect the newborn drops. The majority of commercially available parturition beds were designed for doctors, midwives, and mothers, but not for newborns. As a result, all infants born via vaginal delivery would be at risk of birth injuries from accidental fall. The previous study in 22 labor and delivery rooms revealed only the risks of caregivers and maternal injuries in the workplace, but did not include newborns²⁹. It could mean that the unintentional baby's fall during vaginal delivery was neglected and unrecognized despite one of the achievements of labor outcomes; a safe baby.

There was a case report of an in-hospital newborn who fell during vaginal birth and had to undergo intracranial surgery due to acute epidural hematoma. Without any protection, this baby

dropped from a height of 80 centimeters from the labor bed³⁰. Drop-avoidance must therefore be prioritized in the workstation procedures, because the impact was not only on infants, but also on mothers and families. According to a recent systematic study, there was no data on primary prevention of birth trauma, and secondary prevention of birth injuries and post-traumatic stress disorder after childbirth was ineffective³¹. As a necessary consequence, more solutions for primary prevention of birth injuries are required. According to video recording evidence, the dropping of the mannequin and the near-missing accidents occurred during both station trials. The average incidence of newborn drops in this study was 2.5%.

Compared to previous reports, the incidence was 0.004 percent in the delivery room, so the incidence in this study was 625 times that of previous studies³². It was possible that the frequency of infant-falls during labor in previous studies had been underestimated. However, this trial was an undergraduate simulation test, and the sample size was small.

At the end of this trial, the research team gave the feedback information to all participants in the overview of the topic "What did we learn and how to improve it?" All participants acknowledged that they learned their mistakes from the feedback of assessors, and expected the study managers to recognize their learning problems. As the previous studies have shown, decontextualized knowledge has become a "pragmatic tool" used to improve nursing practice⁵. Practice and feedback have been identified as effective educational techniques. Educational techniques involving passive instruction, such as reading or teaching, have been found to have little impact on learning outcomes³³. This study proposed a safety intervention to supplement vaginal birth training in undergraduates. It had the potential to boost students' confidence in their simulation practice as well as their skills. Most students enjoyed it and were happy with this new safety invention. It demonstrates that their issues have already attracted the attention of the educational administration faculty and have begun to be solved somewhat.

Ethical approval

The author confirmed that the protocol for the research project was approved by the Innovation and Research Ethical Board of the authors' workplace within which the work was undertaken. The approval number was 87/2557.

Conclusion

This birth-fall protective apparatus supplementation in the conventional setting of vaginal birth had coincidental effects with simulation learning in boosting self-efficacy of nursing students. Its attributes fit the needs of these students and assisted them in releasing tension when they had to practice independently.

Limitation and recommendation

According to this study, it might be expected that there could be a bias from student-teacher relationships. At this point, the research team attempted to minimize this error by not disclosing the identity of the inventors and team. The authors asked other nursing students from other institutions to work on behalf of the actual investigators. However, the participants would perhaps know the actual information in different ways.

While our results showed good effectiveness in parturition assistance training, it was only in simulation. It needs to be addressed in the workplace trial. Anyway, most participants were satisfied and gained more self-efficacy in this study.

In real life practice, there was an interprofessional team at work stations. Therefore, the simulation training set-up should be concerned about this fact. One restriction on work was the interprofessional response to work. Recent data has shown that interprofessional preparation enhanced the capacity of students to practice holistic care skills^{34,35}. The author therefore proposed that further research should concentrate on a team-based practice setting, as trainees would be given a realistic atmosphere.

Implications for Nursing Management

To obtain learning achievement in nursing education, not only knowledge and skill preparations were required, but also a clinical learning environment, which included physical spaces, psychological factors, organizational cultures, and a teaching/learning component^{36,37}. These factors contributed to students' learning success and self-confidence^{36,38}. This study demonstrated the impact of learning elements that met the needs of students and sealed their concerns during parturition training. Better self-efficacy would improve their clinical skills and benefit future patients.

References

- Pearlman MD. Patient safety in obstetrics and gynecology: an agenda for the future. *Obstetrics and gynecology* 2006;108(5):1266-71. doi: 10.1097/01.AOG.0000241096.85499.a8 [published Online First: 2006/11/02]
- Cardoso R, Zarin W, Nincic V, Barber SL, Gulmezoglu AM, Wilson K, McDonald H, Kenny M, Warren R, Straus SE and Tricco AC. Evaluative reports on medical malpractice policies in obstetrics: a rapid scoping review. *Systematic reviews* 2017;6(1):181. doi: 10.1186/s13643-017-0569-5 [published Online First: 2017/09/07]
- Sweeney CF, LeMahieu A and Fryer GE. Nurse practitioner malpractice data: Informing nursing education. *Journal of professional nursing: official journal of the American Association of Colleges of Nursing* 2017;33(4):271-75. doi: 10.1016/j.profnurs.2017.01.002 [published Online First: 2017/07/25]
- Antony J, Zarin W, Pham B, Nincic V, Cardoso R, Ivory JD, Ghassemi M, Barber SL, Straus SE and Tricco AC. Patient safety initiatives in obstetrics: a rapid review. *BMJ open* 2018;8(7):e020170. doi: 10.1136/bmjopen-2017-020170 [published Online First: 2018/07/10]
- MacKinnon K, Marcellus L, Rivers J, Gordon C, Ryan M and Butcher D. Student and educator experiences of maternal-child simulation-based learning: a systematic review of qualitative evidence protocol. *JBIR database of systematic reviews and implementation reports* 2015;13(1):14-26. doi: 10.11124/jbisrir-2015-1694 [published Online First: 2015/10/09]
- Cant RP and Cooper SJ. Simulation-based learning in nurse education: systematic review. *Journal of Advanced Nursing* 2010;66(1):3-15. doi: 10.1111/j.1365-2648.2009.05240.x
- Hegland PA, Aarlie H, Strømme H and Jamtvedt G. Simulation-based training for nurses: Systematic review and meta-analysis. *Nurse education today* 2017;54:6-20. doi: 10.1016/j.nedt.2017.04.004 [published Online First: 2017/04/30]
- Alamrani MH, Alammam KA, Alqahtani SS and Salem OA. Comparing the Effects of Simulation-Based and Traditional Teaching Methods on the Critical Thinking Abilities and Self-Confidence of Nursing Students. *The journal of nursing research : JNR* 2018;26(3):152-57. doi: 10.1097/jnr.0000000000000231 [published Online First: 2017/10/11]
- Sadideen H, Hamaoui K, Saadeddin M and Kneebone R. Simulators and the simulation environment: getting the balance right in simulation-based surgical education. *International journal of surgery (London, England)*. 2012;10(9):458-462.
- Krungkraipetch K. Obstetric Safety: The Security Apparatus Enhanced the Self-Efficiency of Medical Students in Vaginal Birth Practice in a Simulation Trial. *Global Journal of Health Science* 2020;12:176. doi: 10.5539/gjhs.v12n8p176
- Chen G, Gully SM and Eden D. Validation of a new general self-efficacy scale. *Organizational Research Methods* 2001;4(1):62-83. doi: 10.1177/109442810141004
- Viola JK. Education Self-Efficacy. Education evaluation toolkit. <https://www.imperial.ac.uk/education-research/evaluation/what-can-i-evaluate/self-efficacy/tools-for-assessing-self-efficacy/>. Accessed Dec, 20, 2021, 2021.
- Gehlbach H and Artino ARJ. The Survey Checklist (Manifesto). *Academic Medicine*. 2018;93(3):360-366.
- Henderson WR. Development of a clinical performance assessment tool for an occupational therapy teaching clinic. 2016;4(3):16. <https://scholarworks.wmich.edu/ojot/vol4/iss3/7/>.
- Levett-Jones T, McCoy M, Lapkin S, Noble D, Hoffman K, Dempsey J, Arthur C and Roche J. The development and psychometric testing of the Satisfaction with Simulation Experience Scale. *Nurse education today*. 2011;31(7):705-710.
- Courtney-Pratt H, Levett-Jones T, Lapkin S, Pitt V, Gilligan C, Van der Riet P, Rossiter R, Jones D and Everson N. Development and psychometric testing of the satisfaction with Cultural Simulation Experience Scale. *Nurse Education in Practice*. 2015;15(6):530-536.
- Dousek S. The satisfaction with simulation experience scale (SSES): A Validation Study. *J Nurs Educ Pract*. 2012;2:74-80.
- Guasconi M, Tansini B, Granata C, Bretta M, Bertuol M, Lucenti E, Deiana L, Artioli G and Sarli L. First Italian validation of the "Satisfaction with simulation experience" scale (SSE) for the evaluation of the learning experience through simulation. *Acta Biomed*. 2021;92(S2):e2021002-e2021002.

19. Suwannakeeree W, Jullmusi O, Inkaew T, Tangkawanich T and Rueangram S. Satisfaction and self-confidence in critical care nursing of nursing students learning with simulation-based learning. *Journal of Nursing and Health Sciences*. 2017;11(3):11.
20. Akalin A and Sahin S. Obstetric simulation in undergraduate nursing education: An integrative review. *Nurs Forum*. 2020;55(3):369-379.
21. Weiss TG and Rentea RM. Simulation Training and Skill Assessment in Obstetrics and Gynecology. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing Copyright © 2021, StatPearls Publishing LLC.; 2021.
22. Kim J, Park JH and Shin S. Effectiveness of simulation-based nursing education depending on fidelity: a meta-analysis. *BMC medical education*. 2016;16:152.
23. Katz-Navon T, Naveh E and Stern Z. Safety self-efficacy and safety performance: potential antecedents and the moderation effect of standardization. *International journal of health care quality assurance*. 2007;20(7):572-584.
24. Nykänen M, Salmela-Aro K, Tolvanen A and Vuori J. Safety self-efficacy and internal locus of control as mediators of safety motivation – Randomized controlled trial (RCT) study. *Safety Science*. 2019;117:330-338.
25. Bandura A and Adams NE. Analysis of self-efficacy theory of behavioral change. *Cognitive Therapy and Research*. 1977;1(4):287-310.
26. Sohail N. Stress and academic performance among medical students. *Journal of the College of Physicians and Surgeons--Pakistan : JCPSP*. 2013;23(1):67-71.
27. Baksi A, Gumus F and Zengin L. Effectiveness of the Preparatory Clinical Education on Nursing Students Anxiety: A Randomized Controlled Trial. *International Journal of Caring Sciences*. 2017;10(2):1003-1012.
28. Judd BK, Currie J, Dodds KL, Fethney J and Gordon CJ. Registered nurses psychophysiological stress and confidence during high-fidelity emergency simulation: Effects on performance. *Nurse education today*. 2019;78:44-49.
29. Stichler JF, Feiler JL and Chase K. Understanding risks of workplace injury in labor and delivery. *Journal of obstetric, gynecologic, and neonatal nursing : JOGNN*. 2012;41(1):71-81.
30. Josephsen JB, Kemp J, Elbabaa SK and Al-Hosni M. Life-threatening neonatal epidural hematoma caused by precipitous vaginal delivery. *The American journal of case reports*. 2015;16:50-52.
31. de Graaff LF, Honig A, van Pampus MG and Stramrood CAI. Preventing post-traumatic stress disorder following childbirth and traumatic birth experiences: a systematic review. *Acta obstetrica et gynecologica Scandinavica*. 2018;97(6):648-656.
32. Monson SA, Henry E, Lambert DK, Schmutz N and Christensen RD. In-hospital falls of newborn infants: Data from a multihospital health care system. *PEDIATRICS*. 2008;122(2):E277-E280.
33. Bluestone J, Johnson P, Fullerton J, Carr C, Alderman J and BonTempo J. Effective in-service training design and delivery: evidence from an integrative literature review. *Human Resources for Health*. 2013;11(1):1-26.
34. Stewart LS, Stringer TH, VanRegenmorter J, Miller S, Alexander EH and Phillippi JC. Interprofessional Simulation for Nursing and Divinity Students: Learning Beyond Checklists. *Clinical Simulation in Nursing*. 2019;35:10-16.
35. Slinkard PM and Stonehocker J. Women's Health Outpatient Care Teams: Focus on Advanced Practice Providers. *Clinical Obstetrics and Gynecology*. 2018;61(1):76-89.
36. Flott EA and Linden L. The clinical learning environment in nursing education: a concept analysis. *J Adv Nurs*. 2016;72(3):501-513.
37. Perry P. Concept analysis: confidence/self-confidence. *Nurs Forum*. 2011;46(4):218-230.
38. Hart JA and Swenty CF. Understanding Transitions to Promote Student Success: A Concept Analysis. *Nurs Forum*. 2016;51(3):180-185.