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Effects of Simulation-Based Mastery Learning versus Deliberate Practice on midwifery students' knowledge, skills and self confidence in managing the third stage of labour: A quasi-experimental study

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Abstract

Achieving maternal health care coverage by 2030 requires strengthening the midwifery workforce. To ensure accessible, culturally appropriate, and high-quality care, midwives must receive education aligned with global standards. This study aimed to evaluate the effect of a 20 hours Simulation-Based Mastery Learning (SBML) combined with Deliberate Practice (DP) and the Objective Structured Clinical Examination (OSCE) on midwifery students' knowledge, skills, and self-confidence in managing the third stage of labor. Sixty midwifery students were randomly allocated to experimental (n = 30) and control (n = 30) groups. Following the intervention, all students met or surpassed the minimum passing standard (MPS), achieving at least 90% in skills (Z=-4.791; p<.001; r~0.87), 80% in knowledge (Z=-4.814; p<.001, r~0.87), and an increased score in self-confidence (Z=-4.792; p<.001; r~0.87). These improvements were maintained after the clinical experience. The performance of students trained through the traditional approach was significantly lower than that of those trained with SBML, and none of them achieved the MPS. This study highlights the need to structure nursing and midwifery training programs according to the Theory-SBML-Clinical placement model to strengthen students' competencies. *(Afr J Reprod Health 2026; 30 [7]:80-91).*

Keywords: Active management of the third stage of labour, simulation based mastery learning, deliberate practice, objective structured clinical examination, midwifery students.

Résumé

La réalisation de la couverture universelle des soins de santé maternelle d'ici 2030 passe par un renforcement substantiel de la profession de sage-femme. Pour assurer des soins accessibles, culturellement adaptés et de qualité optimale, il est essentiel que les sages-femmes bénéficient d'une formation conforme aux normes internationales. Cette étude avait pour objectif d'évaluer l'impact de 20 heures d'apprentissage par simulation fondé sur la pédagogie de la maîtrise, la pratique délibérée, et l'Examen Clinique Objectif Structuré (ECOS) sur les connaissances, les compétences et la confiance en soi des étudiantes sages-femmes dans la prise en charge de la troisième phase de l'accouchement. Un total de 60 étudiantes sages-femmes ont été réparties de façon aléatoire en un groupe expérimental (n = 30) et un groupe témoin (n = 30). À la suite de l'intervention, toutes les étudiantes ont atteint ou dépassé la norme minimale de réussite (MPS), obtenant au moins 90 % en compétences (Z=-4.791; p<.001 ; r~0.87), 80% en connaissances (Z=-4.814; p<.001 ; r~0.87), ainsi qu'une amélioration de leur score de confiance en soi (Z=-4.792; p<.001 ; r~0.87). Ces progrès ont été conservés après l'expérience clinique. Les performances des étudiantes formées selon l'approche traditionnelle étaient significativement inférieures, et aucune d'entre elles n'a atteint le Seuil Minimal de Réussite (SMR). L'apprentissage par maîtrise, la pratique délibérée et l'ECOS apparaissent comme des éléments essentiels au développement d'un programme de formation par simulation de haute qualité, favorisant un transfert efficace des acquis vers la pratique clinique. *(Afr J Reprod Health 2026; 30 [7]: 80-91).*

Mots-clés: Gestion active de la troisième phase de l'accouchement, Apprentissage par maîtrise, Simulation, Pratique Délibérée, Examen Clinique Objectif Structuré, Sage-Femme.

Introduction

In 2023, about 260 000 women worldwide died during and following pregnancy and childbirth[1]. Obstetric haemorrhage, especially postpartum haemorrhage (PPH), is responsible for approximately 27% of all maternal deaths.[2] The main consequences of severe postpartum hemorrhage include death, hypovolemic shock, disseminated intravascular coagulation, renal failure, liver failure, and acute respiratory distress syndrome.[3] Nonetheless, the majority of postpartum haemorrhage cases are considered avoidable or potentially preventable, with effective prevention and management relying on the timely application of evidence-based clinical guidelines.[4]

The third stage of labour, defined as the period from the birth of the baby to the expulsion of the placenta and membranes,[5] is the most critical phase for the occurrence of postpartum haemorrhage. Research on the Active Management of the Third Stage of Labour (AMTSL) has shown a decrease in the incidence of primary blood loss exceeding 500 ml, the administration of therapeutic uterotonics, and the requirement for maternal blood transfusion.[5] Evidence further suggests that, compared to physiological care, AMTSL lowers the relative risk of postpartum haemorrhage by approximately 60%.[6-7] AMTSL is recommended by the International Federation of Gynecology and Obstetrics (FIGO), the International Confederation of Midwives (ICM), and the World Health Organization (WHO) as a key intervention to prevent postpartum haemorrhage in all vaginal births.[8-7] Recently, a modified active approach, comprising a standardized package of three interventions, is currently integrated into clinical guidelines. The three components are: (1) administration of a uterotonic agent; (2) delaying umbilical cord clamping for 2 to 3 minutes to enhance the health of both mother and child, as well as improve the child's nutritional status; and (3) active removal of the placenta using controlled cord traction (CCT) after signs of placental separation are evident. However, a significant proportion of healthcare providers may not be adhering to evidence-based recommendations supporting modified active.[7- 9- 8]Studies show that an efficient training program on the AMTSL successfully facilitates the acquisition of essential knowledge and skills among midwifery students.[10] Simulation-based mastery learning (SBML) represents an intensive approach to competency-based education, in which all participants must achieve a high standard of proficiency before completing the training, as demonstrated through a post-training assessment.[11]

In Morocco, studies have shown that midwifery students and newly graduated midwives are often inadequately prepared to handle the full scope of midwifery practice, highlighting persistent gaps in the quality of midwifery education.[12-13-14] Furthermore, the integration of simulation based learning into midwifery education remains relatively limited, with few studies exploring its application in the training of midwifery students.[12] Accordingly, this study aimed to evaluate the effect of SBML with DP on midwives' knowledge, skills and self-confidence related to the AMTSL. The hypothesis was that combining lectures, SBML with deliberate practice, and subsequent clinical experience would improve these outcomes and promote a more effective transfer of competencies to clinical practice.

Simulation training represents a common approach in the field of engineering midwifery clinical education.[15] Although traditional apprenticeship models continue to be widely employed, it is increasingly recognized that the acquisition of proficiency in high-risk procedures should not rely solely on experiential learning within the operating room.[16] Furthermore, simulation-based environments provide students with the opportunity to experience the full range of midwifery practice. In contemporary clinical training, the close supervision of midwifery students is intended to prevent or substantially limit the occurrence of such errors, thereby reducing opportunities to learn from mistakes in real patient care settings.[12]

Studies have demonstrated that SBML not only improves clinical skills but also results in better patient care and outcomes compared to traditional training approaches.[17-18] In this approach, learners start with a baseline assessment on a simulator, followed by engagement with standardized instructional resources such as lectures and demonstrations. They then take part in targeted simulator practice sessions, supported by expert feedback.[11] The process concludes with a post-training skills assessment, during which learners must meet or surpass a predefined minimum passing standard (MPS). Students who initially fail to demonstrate mastery, receive additional opportunities to study and to retest until they achieve mastery.[11] The fundamental principles of mastery learning are as follows: (1) educational excellence is expected and can be achieved by all learners, and (2) little to no variation is observed in measured outcomes among learners in a mastery-based environment.[11]

A well-established principle underpinning simulation-based mastery learning is DP. The primary objective of DP is the continuous enhancement of skills, rather than simple preservation. Empirical evidence indicates that DP is a significantly stronger predictor of professional achievement than either accumulated experience or academic aptitude.[19], Besides, simulation strengthens confidence, an important trait for effective midwifery practice. While closely connected, confidence and competence are not synonymous. Confidence involves “a feeling of trust in one’s abilities, qualities, and judgment,” whereas competence denotes “the ability to execute a task successfully or efficiently”[20].

Building on this body of evidence, the research team designed and implemented a SBML program incorporating Deliberate Practice (DP). This study aimed to evaluate the effect of a 20 hours Simulation-Based Mastery Learning (SBML) combined with Deliberate Practice (DP) and the Objective Structured Clinical Examination (OSCE) on midwifery students’ knowledge, skills, and self-confidence in managing the third stage of labor.

Methods

Study design

This study employed a quasi-experimental design using a pre-test, post-test, two-group approach. The training sessions were conducted in the simulation laboratory and the debriefing room of Higher Institute of Nursing Professions and Health Techniques (HINPHT) in Fez between May and December 2024.

Participants

Third year students as well as those in their second year took part in a mastery-based learning program, grounded in simulation and deliberate practice. Based on power analysis using G*Power program Version 3.1.9.4, the sample size was estimated using the effect size from a previous study.[21] In this instance, at least 21 midwifery students were required for each group (intervention group and control group) to achieve an alpha level of 0.05, a power of 0.80, and an effect size of 0.8.[22] To account for potential attrition, the sample size was increased by 20%.[23] Students were randomly assigned to two groups: 30 to the intervention group, which received a lecture, SBML with DP sessions, and clinical experience; and 30 to the control group, which followed the standard midwifery curriculum consisting of lecture and clinical experience (See Figure 1). The inclusion criteria included midwifery students at HINPHT of Fez who possessed the requisite theoretical knowledge for managing both normal and high-risk deliveries. Participants were excluded in cases of absence from any study intervention session or if they opted to withdraw from the study.

Instruments and data analysis

The socio-demographic profile encompassed variables such as gender, age, and year of training. Knowledge data were collected using a questionnaire consisting of nine multiple-choice questions on current AMTSL practice.[24] Each question had a single correct answer, scored as 1 for a correct response and 0 for an incorrect one. A minimum score of 80% correct responses was regarded as indicative of mastery of the corresponding knowledge.[25] The students' skills were assessed by three assessors using the Objective Structured Clinical Examination (OSCE), and an AMTSL scenario. The clinical competence assessment checklist was adopted from the training program package published by Johns Hopkins Program,[24] and revised according to the latest WHO and ICM/ FIGO AMTSL guidelines.[7-9]

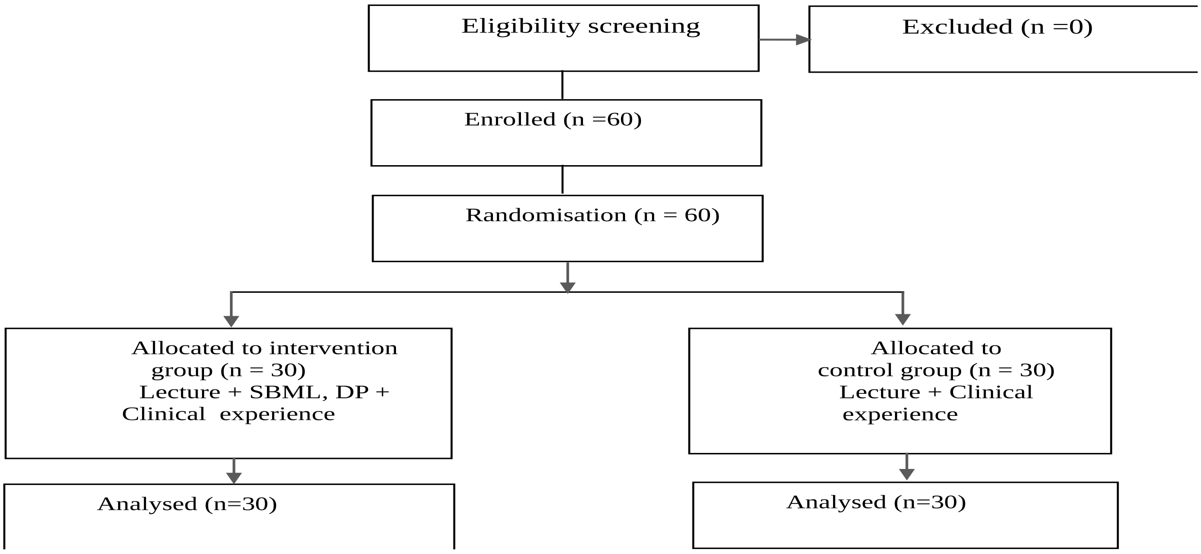

Figure 1: Process of participant selection

The checklist had 11 steps, and each skill was assessed using an overall 5-point rating scale (Insufficient Performance = 1; Excellent Performance = 5). A minimum score of 90% correct steps was considered indicative of mastery of the AMTSL competency.[25] The Minimum Passing Standards (80% for knowledge and 90% for skills) were established and subsequently validated by a panel of six experienced midwifery educators, ensuring that the performance criteria accurately reflect the competencies required for safe and effective clinical practice.The tool showed satisfactory internal consistency, evidenced by a Cronbach's alpha of 0.73 and a Content Validity Index (CVI) of 0.90. Inter-rater reliability, determined using Cohen's Kappa, was 1.0, reflecting perfect agreement among raters. The self-confidence questionnaire was a self-reported checklist developed by the researchers based on the Training Package developed by Johns Hopkins Program.[24] The CVI score was 0.90, and the Cronbach's alpha was .968. It was answered on a 5-point Likert scale using "1=Not at all confident to 5=Extremely confident".

Data analysis was performed using IBM SPSS Statistics version 26.0. Descriptive statistics, including percentages, means, and standard deviations, were used to examine the participants' sociodemographic characteristics. For the comparative analysis of pre- and post-experiment data, the non-parametric Wilcoxon signed-rank test and the Mann–Whitney test were employed. This choice for data analysis is justified by the potential non-normality as indicated by Shapiro-Wilk tests ($W = 0.404–0.925$, $p < 0.01$), making parametric tests inappropriate. Fisher's exact test was also used to analyze the differences between the checklist items. Statistical significance was determined at a threshold of $p < 0.05$.

Design of the intervention

The training program included 20 hours of simulation and deliberate practice in the simulation laboratory, delivered in weekly intervention sessions over five weeks, along with 20 hours of clinical training conducted over a two-week period. A high-fidelity simulation scenario was developed and implemented to ensure a standardized and controlled learning environment for participants. The scenario script was co-designed by experienced midwifery educators and clinicians to guarantee both pedagogical alignment and clinical accuracy. The scenario script is detailed as follows: "You are a midwife working in a level-1 rural birthing center, and you are alone on duty during the night shift. In the labor room, you are caring for Mrs. [XX] (Simulated Patient), a 28-year-old woman, gravida 4, para 4. The clinical examination on admission showed: blood pressure 120/60 mmHg, temperature

37.2°C, fundal height 33 cm, regular uterine contractions, cervix 60% effaced and 5 cm dilated, vertex presentation engaged, membranes ruptured, and clear amniotic fluid. Labor progressed without major complications. The woman has just delivered a healthy term newborn spontaneously, with an Apgar score of 9 at 1 minute. You must now actively manage the third stage of labor to prevent complications, particularly postpartum hemorrhage".

During the practical training sessions, the first author delivered the theoretical content, facilitated the training activities, and conducted the explanations and debriefing sessions. She is an experienced midwife, holds a Master's degree in Midwifery Education, and a doctorate in Didactics of Nursing Science. The training programme was implemented in the following sequential phases:

Initial assessment phase

Participants' knowledge was evaluated before the training commenced, and an individual assessment of technical skills was performed at the OSCE.

Prebrief

This phase was designed and implemented based on the International Nursing Association for Clinical Simulation and Learning (INACSL) Standards of Best Practice in simulation.[26] The program began with theoretical training via PowerPoint presentations, posters, and treatment algorithms, detailing the clinical scenario and assigning roles to all participants, including the simulated patient.

Implementation

After the briefing, the skills were simulated by the facilitator. Subsequently, the students take part in deliberate practice sessions. During the deliberate practice session, the facilitator provided appropriate feedback throughout the activity, and repetitions were continued until each learner had mastered the targeted skill, in accordance with her individual learning progression.

Debriefing

Immediately after the initial simulation experience, the students participated in debriefing session based on the PEARLS model (Promoting Excellence and Reflective Learning in Simulation).[27]

Assessment/ determination of the level of mastery

Data were collected at three assessment points: prior to the simulation, immediately post-simulation, and after the clinical placement in the maternity ward. At each stage, performance was evaluated using OSCE stations. Participants must meet or exceed a minimum passing standard (MPS) of 90% for the skills dimension. Those who do not achieve the MPS on the initial posttest are required to participate in additional deliberate practice until they are eligible for retesting and successfully reach the MPS. Afterward, participants complete a two-week clinical training in a maternity unit, followed by a final assessment.

Ethical considerations

The study was approved by the Ethics Committee of Abdelmalek Essaâdi University, with the reference number (AC58JN), Morocco. All participants were fully informed about the study's objectives and procedures and provided written informed consent on a voluntary basis. Confidentiality and anonymity of their responses were guaranteed, and all data were securely stored and used exclusively for research purposes. Furthermore, participants were informed of their right to withdraw from the study at any time without any negative consequences.

Results

Participants characteristics

All participants in this study were women, consistent with the gender-specific nature of the midwifery profession in Morocco.[12] The participants had a mean age of 22.55 years (±3.02 SD). Half were enrolled in the third semester, and the other half in the sixth semester. Table 2 presents a comparative summary of the changes in knowledge, skills, and self-confidence within each group, together with the corresponding effect sizes. In the intervention group, the Wilcoxon test indicated statistically significant changes in the median scores for all three competencies related to AMTSL across the assessment periods.

Table 1: Demographic characteristics of the participants (N = 60)

Variable	f	%
Gender		
male	0	0%
female	60	100%
Age	Mean= 22.55, SD=3.02 Range= 20-37	
Year of training		
Second year	30	50.0%
Third year	30	50.0%

Note: f (%): frequency with its corresponding percentage

Knowledge scores improved significantly at every evaluation stage, with large effect sizes in the posttest (Z= -4.814, p < 0.001, Cohen's d = -0.87), and following the completion of clinical training (Z=-4.146, p < 0.001, Cohen's d = -0.75). Skills scores also demonstrated consistent and significant gains, accompanied by large effect sizes in the Final posttest (Z=-4.791, p < 0.001, Cohen's d =-0.87), and after the clinical experience (Z=-3.788, p < 0.001, Cohen's d = -0.69). Similarly, self-confidence scores increased significantly over time, with large effect size observed both at the final posttest (Z=-4.815, p < 0.001, Cohen's d = -0.87), and following the clinical experience (Z=-4.115, p < 0.001, Cohen's d = -0.75). These findings demonstrate that the mastery learning model positively impacts students' knowledge, skills, and self-confidence in the performance of clinical competencies.In contrast, a significant increase in knowledge was observed in the control group immediately after the lecture course (Z=-2.804, p < 0.001, Cohen's d = -0.51). However, this improvement was not sustained, as scores declined by the third assessment point, following the clinical experience, with only a negligible effect remaining (Z=-.447, p=0.655, Cohen's d = -0.081). Additionally, no significant changes were observed in the skills, and self-confidence scores for AMTSL within the control group across the three assessment time points (P > 0.05). Table 3 highlights significant differences between groups at both the final posttest and following the clinical experience across all measured variables. Specifically, for knowledge, the intervention group demonstrated superior performance compared to the control group at the posttest (Z= -6.478, p < 0.001, Cohen's d = -0.83), and again after the clinical experience (Z=-6.763, p < 0.001, Cohen's d = -0.87). Similarly, a statistically significant difference in skills was observed between groups at the final posttest, with a large effect size (Z=-6.713, p < 0.001, Cohen's d =-0.86), and at the post clinical experience (Z=-6.685, p < 0.001, Cohen's d =-0.86). Self-confidence scores also differed significantly between groups with a corresponding medium effect size at the final posttest (Z=-3.365, p < 0.001, Cohen's d =-0.43), and following the clinical experience (Z=-3.581, p < 0.001, Cohen's d=-0.46). These findings indicate that the intervention substantially improved knowledge, skills, and self-confidence compared to the control condition.

Figures 2, and 3 show that, at the pretest, none of the students attained the MPS. Following the program implementation, 23 students (76,66%) attained the mastery threshold, the remaining 7 students (23.33%) required additional debriefing and deliberate practice sessions to achieve the MPS. at the final posttest all midwifery students in the intervention group met successfully the MPS. An improvement was also observed after the clinical placement, demonstrating that the mastery learning program enhances the transfer of skills to real-life situations. In the control group, where the traditional lecture-based model followed by clinical experience was applied, none of the students achieved the MPS.

According to the AMTSL competency checklist (Table 4), a significant variation in students' skill levels was observed between the pretest, the final posttest, and the post clinical experience assessment. With regard to the critical steps of care, only 3 students (10%) correctly assessed the risk of postpartum hemorrhage (PPH) during the pretest, compared to 25 students (83.3%) at the final posttest (p < 0.001), and 28 students (93.3%) during the post clinical assessment.

Similarly, only 5 students (16.7%) administered the uterotonic treatment at the appropriate time during the pretest, compared to 26 students (86.7%, p < 0.05) at the posttest, and all students (100.0%, p < 0.001) during the in-situ assessment.Likewise, only 7 students (23.3%) were able to quantify blood loss during the pretest, compared to 26 students (86.7%, p < 0.001) at the posttest, and all students (100.0%, p < 0.05) in situ.

Table 2: Analysis of changes in knowledge, skills, and self-confidence following the educational intervention within each group

Variable	Group	Time	Median (Min-Max)	Wilcoxon test	p-value	Effect size (r)
Knowledge	**Intervention**	Pretest	11.90 (9.00-14.00)	-	-	
		Posttest	17.23(16.00-18.00)	-4.814	.000	-0.87
		Post clinical experience	17.86 (17.00-18.00)	-4.146	.000	-0.75
	Control	Pretest	12.13 (10.00-14.00)	-	-	
		Posttest	12.96 (11.00-18.00)	-2.804	.005	-0.51
		Post clinical experience	12.86 (11.00-18.00)	-.447	.655	-0.081
Skills	**Intervention**	Pretest	36.06 (29.00-41.00)	-	-	
		Final posttest	50.23 (47.00-53.00)	-4.791	.000	-0.87
		Post clinical experience	51.40 (50.00-54.00)	-3.788	.000	-0.69
	Control	Pretest	38.23 (31.00-43.00)	-	-	
		Final posttest	38.93 (31.00-48.00)	-1.342	.180	-0.24
		Post clinical experience	38.73(31.00- 48.00)	-.535	.593	-0.09
Self-confidence	**Intervention**	Pretest	21.73 (13.00-47.00)			
		Final posttest	36.00 (24.00-50.00)	-4.792	.000	-0.87
		Post clinical experience	40.50 (24.00-54.00)	-4.115	.000	-0.75
	Control	Pretest	22.26 (12.00-47.00)	-	-	
		Final posttest	22.36 (12.00-47.00)	-.105	.917	-0.01
		Post clinical experience	22.03 (12.00-47.00)	-1.841	.066	-0.33

Note: *Effect sizes were interpreted according to Cohen's criteria: 0.1 indicates a small effect, 0.3 a medium effect, and 0.5 a large effect. (Intervention Group, n=30; Control group, n=30). Negative values indicate improvement*.

Table 3: Comparison of knowledge, skills, and self-confidence scores between groups before and after the intervention (N = 60).

Variables	Time	Median		Mann-Whitney U	Z-score	Asymp. Sig. (2-tailed)	Effect size
		Intervention	**Control**				
Knowledge	Pretest	28.85	32.15	400.500	-.762	.446	-0.09
	Post-test	44.63	16.37	26.000	-6.478	.000	-0.83
	Post clinical experience	44.93	16.07	17.000	-6.763	.000	-0.87
Skills	Pretest	31.18	29.82	429.500	-.306	.760	-0.03
	Final post-test	45.50	15.50	.000	-6.713	.000	-0.86
	Post clinical experience	45.05	15.95	.000	-6.685	.000	-0.86
Self-confidence	Pretest	29.72	31.28	426.500	-.349	.727	-0.04
	Final post-test	38.07	22.93	223.000	-3.365	.001	-0.43
	Post clinical experience	38.55	22.45	208.500	-3.581	.000	-0.46

Note: *Comparison between the intervention and control groups. with negative values indicating improvement. Effect sizes were interpreted according to Cohen's criteria: 0.1 indicates a small effect, 0.3 a medium effect, and 0.5 a large effect. n represents the number of participants.*

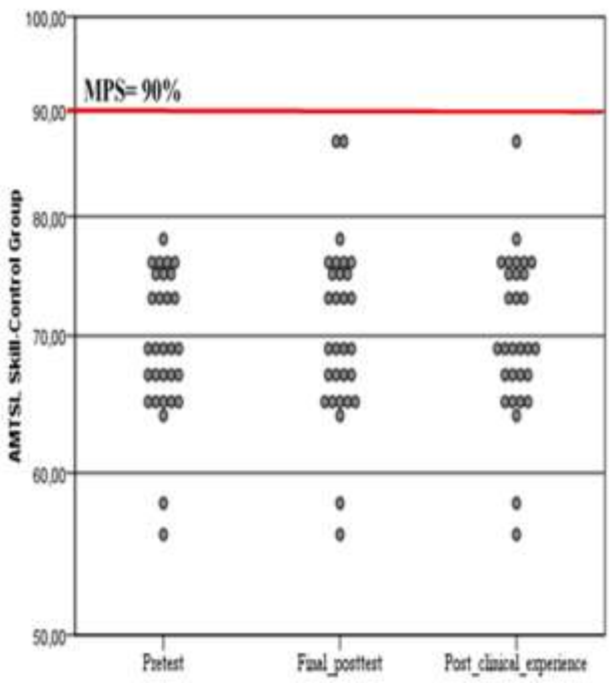

Fig. 2. Clinical skills performance of midwifery students in the control group at three assessment points: pretest, posttest, and post-clinical experience. Each circle represents an individual student.

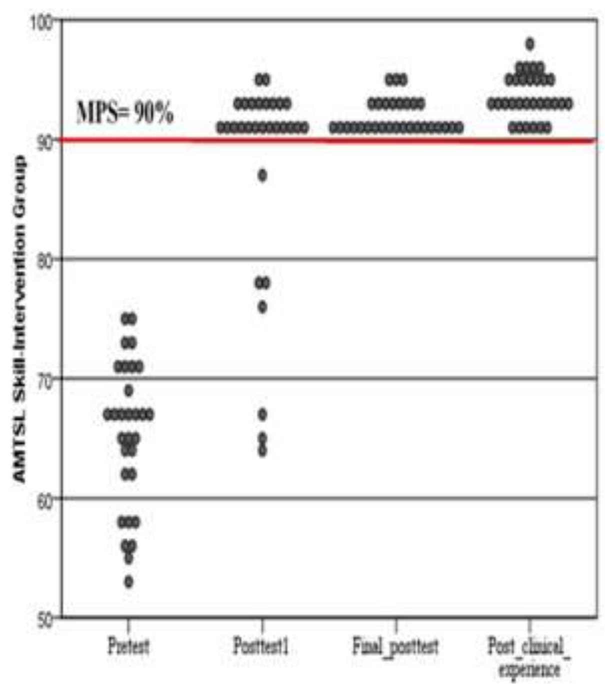

Fig. 3 . Clinical skills performance of midwifery students in the intervention at four assessment points: pretest, first posttest, final posttest, and post-clinical experience test. Each circle represents an individual student.

Table 4: AMTSL checklist showing the percentage of participants in the intervention group who correctly performed each item during the pretest, Final posttest, and post clinical experience for each evaluated skill.

Skill	Pretest n=30	Final posttest n=30	p-value	Post clinical experience n=30	pvalue
Assess the risk of postpartum hemorrhage (PPH) according to the established protocol	3 (10.0%)	25 (83.3%)	.000	28 (93.3%)	.002
Obtains the woman's consent prior to administering the uterotonic treatment	11 (36.7%)	30 (100.0%)	.000	30 (100.0%)	.000
Administers 10 IU of oxytocin within one minute after the birth of the baby, specifying the dose, route of administration, name of the medication, and the correct technique.	5 (16.7%)	26 (86.7%)	.005	30 (100.0%)	.007
Observes aseptic measures during care	25 (83.3%)	29 (96.7%)	.000	29 (96.7%)	.000
Waits 2 to 3 minutes after birth before clamping the umbilical cord	18 (60.0%)	30 (100.0%)	.001	30 (100.0%)	.002
Applies gentle countertraction during controlled cord traction	15 (50.0%)	29 (96.7%)	.007	29 (96.7%)	.010

Carries out controlled cord traction exclusively during a uterine contraction	19 (63.3%)	30 (100.0%)	.044	30 (100.0%)	.006
Examines the placenta to ensure it is complete	18 (60.0%)	29 (96.7%)	.049	29 (96.7%)	.052
Examines the vagina and perineum for lacerations or tears	9 (30.0%)	29 (96.7%)	.036	30 (100.0%)	.123
Use a calibrated drape to measure blood loss, with marked trigger lines at 300 ml and 500 ml during the first hour after birth	7 (23.3%)	26 (86.7%)	.000	30 (100.0%)	.016
Provides appropriate monitoring after birth	8 (26.7%)	28 (93.3%)	.039	28 (93.3%)	.039

Finally, only 8 students (26.7%) performed appropriate postpartum monitoring at the pretest, compared to 28 (93.3%, $p < 0.05$) at the final posttest and following the clinical experience.

Discussion

Results indicate that, in the control group, where the traditional lecture- clinical training model was adopted, none of the students attained the MPS. This suggests that the conventional approach may be insufficient in ensuring students reach the required competency levels for AMTSL. However, despite exposure to clinical settings, the lack of structured, mastery-oriented training could have limited skill acquisition and confidence development. These findings highlight potential shortcomings of relying solely on didactic lectures combined with unstructured clinical practice, emphasizing the need for more effective educational strategies to enhance learning outcomes. This finding aligns with previous studies that have underscored the limitations of the lecture-clinical training model in reliably ensuring students attain the necessary competencies.[12] Moreover, the traditional model often lacks standardized supervision and structured feedback, which are critical for skill refinement and confidence building.[13] This gap can lead to variable learning experiences and uneven competency acquisition among students.

Our results further showed that none of the participants in the intervention group achieved the MPS at the pretest, emphasizing the need for the implemented educational intervention. This poor performance revealed a considerable knowledge gap compared to the standards set by the midwifery curriculum. Mastery learning models are designed to address these deficiencies by ensuring that graduates attain the requisite competencies and comply with established professional standards.[28-11] Following participation in the SBML program, a significant improvement was observed in participants' knowledge, clinical skills, and self-confidence. The data obtained are consistent with existing research on skill acquisition and retention. Notably, studies by [29-18-30-31-32] consistently demonstrated that learners trained using a mastery learning approach achieve a high performance outcomes. The empirical evidence from the aforementioned studies is robust, providing tangible support for the testability of the theory. Other studies have supported the early integration of this model into the curriculum in order to achieve core performance levels comparable to those gained through clinical experience.[33] A systematic review of competency-based education among nursing students revealed that those trained using this approach are competent learners who possess the minimum requirements to perform their professional roles in the future.[34]

Indeed, one possible explanation for the improvement in knowledge and skill scores in this study could lie in the combination of interactive training methods, based on repeated performance, frequent feedback, and the establishment of a threshold that all students were required to meet. The repetition of complex scenarios helped learners improve their clinical skills, develop automatic responses, and build greater confidence. Comparable findings have been observed in the field of medicine. Notably, studies by McGaghie and colleagues, Mikhaeil-Demo and colleagues,[11-30] demonstrated that training programs incorporating deliberate practice led to significant improvements in residents’ performance.

Another advantage of this model is that it allows students experiencing difficulties to benefit from extended training time. This flexibility in terms of training hours allows for addressing individual needs by giving each student the opportunity to master skills at their own pace, without undue pressure.[32] The additional time also enables the reinforcement of specific skills that require more practice or repetition, thereby promoting more personalized learning and better skill acquisition.[11]

Another important component of our intervention was individualized feedback and debriefing sessions, which provided learners with targeted guidance, clarified misunderstandings, and facilitated reflective learning to enhance both technical and non-technical skills. This result aligns with findings from other studies indicating that the provision of feedback and corrective actions, facilitates individualized progression and supports the development of clinical judgment and professional competence.[35-36] Structured debriefing sessions between learners and instructors play a critical role in simulation-based education, as they contribute to enhanced learning outcomes. These include improved performance skills, critical thinking, clinical reasoning, clinical judgment, problem-solving abilities, learner satisfaction with both the simulation and the debriefing process, as well as the overall quality of debriefing.[37]

A notable improvement in skills was observed following the clinical experience. This result highlights a key strength of the study, demonstrating successful transfer of competence to practical clinical environments. This result aligns with previous research highlighting the crucial role of this model in enabling the transfer of clinical skills from simulation to actual patient care environments.[31] Laboratory skills training effectively prepares students for clinical placements, facilitates the transition to clinical practice, and results in a higher number of procedural skills being performed at the patients' bedside in hospital settings.[29] This study adds valuable support to the increasing amount of empirical research demonstrating that skills acquired through simulation-based education can be successfully applied in real clinical settings. It provides nurse educators with practical guidance and effective approaches for integrating evidence-based teaching methods into their training programs, ultimately enhancing the quality of patient care.

The results of this study support the inclusion of simulation-based training into national policies for maternal and newborn health education. In Morocco and other low- and middle-income countries, policymakers should consider making simulation a mandatory component of both pre-service education and continuing professional development for midwives, nurses, and physicians. This policy direction implies sustained investment in simulation infrastructure, including skills laboratories, low- and high-fidelity simulators, and faculty development. Furthermore, incorporating simulation-based performance indicators into accreditation and licensing frameworks may contribute to ensuring long-term competence in hemorrhage prevention. From a practice perspective, the study underscores the importance of embedding regular simulation exercises within clinical settings to reinforce early recognition, prevention, and timely management of hemorrhage. Health facilities should therefore institutionalize routine simulation sessions as part of quality improvement and patient safety initiatives.

Nevertheless, the implementation of simulation-based mastery learning (SBML) in midwifery programs encounters several challenges. Limited resources and infrastructure often constrain access to high-fidelity simulators and fully equipped skills laboratories. Moreover, issues related to the maintenance and sustainability of simulation equipment, cultural unfamiliarity with simulation methods, and the absence of locally adapted, evidence-based protocols present additional obstacles. Effective implementation of this model requires faculty training in both the principles of simulation-based learning and the application of deliberate practice with performance-based assessment. Another critical aspect is the development of standardized tools and resources, including validated checklists, structured scenarios, and clear assessment criteria aligned with competency-based objectives. These elements are essential to ensure consistency in training, objective evaluation of learners' performance, and continuous quality improvement of educational programs.

Limitations and future studies

This study presents several limitations that warrant consideration. The single-center design, conducted solely at the HINPHT in Fès, restricts the extent to which the results can be generalized to other midwifery training institutions in Morocco or to different educational contexts where resources, instructional approaches, and learner characteristics may vary. Additionally, the study did not include follow-up measurements to evaluate long-term retention or the transfer of competencies to real clinical environments. This absence of longitudinal assessment limits our ability to determine whether the gains observed immediately after training are sustained over time or translate into improved performance in practice. Future research should therefore incorporate multi-center designs and extended follow-up periods to strengthen the external validity of the findings and to better understand the durability and clinical transferability of SBML-acquired skills..

Conclusion

In conclusion, this study provides promising evidence that SBML, combined with DP, can significantly enhance midwifery students' knowledge, skills, and self-confidence, while also supporting the effective transfer of competencies to clinical practice. Future research could explore the adaptation of the current training program model to integrate additional essential competencies, addressing emerging needs in clinical practice. Expanding the model to encompass other nursing specialties would allow for a broader evaluation of its effectiveness across diverse contexts, potentially informing the development of standardized, multidisciplinary simulation-based mastery learning curricula.

Such adaptations could not only optimize learning outcomes and enhance skill acquisition but also contribute to improving the quality of care. Ultimately, by strengthening the competencies of healthcare providers, this work has the potential to play a significant role in reducing maternal mortality and improving maternal and neonatal health outcomes.

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