Thai Health Sciences Frontiers
วารสารวิทยาศาสตร์สุขภาพไทยก้าวหน้า
THSF

ORIGINAL ARTICLE

Development of Clinical Nursing Practice Guidelines for the Prevention of Early Postpartum Hemorrhage in the Labor Room, Ban Dung Crown Prince Hospital, Udon Thani Province

Ratsanee Saengmontri[1*], Watcharaphon Joongthai[2]

[1] Registered Nurse, Labor Room Nursing Unit, Nursing Department, Ban Dung Crown Prince Hospital, Ban Dung District, Udon Thani Province

[2] Registered Nurse, Research and Development Unit, Nursing Department, Ban Dung Crown Prince Hospital, Ban Dung District, Udon Thani Province

* Corresponding author

☐ **Received:** August 11, 2026 ✓ **Revised:** August 17, 2026 ☑ **Accepted:** August 28, 2026

Citation: Ratsanee Saengmontri, Watcharaphon Joongthai. Development of Clinical Nursing Practice Guidelines for the Prevention of Early Postpartum Hemorrhage in the Labor Room, Ban Dung Crown Prince Hospital, Udon Thani Province. Thai Health Sciences Frontiers. 2026;1(2):73-86.

Abstract

This action research aimed to 1) develop clinical nursing practice guidelines for the prevention of early postpartum hemorrhage (PPH) in the labor room of Ban Dung Crown Prince Hospital, Udon Thani Province, 2) evaluate the outcomes of guideline implementation, 3) test the outcomes against predefined criteria using inferential statistics, and 4) compare knowledge and self-care practices of postpartum women before and after receiving care under the guideline. The Plan–Act–Observe–Reflect cycle was applied with an evidence-based practice approach from January to August 2026. Participants were 13 registered nurses in the labor and postpartum nursing units (total population). In addition, 32 postpartum women who received care under the guideline were included for outcome evaluation. The study had three phases: situation analysis and planning, guideline development and pilot implementation, and outcome evaluation and reflection. Instruments were a demographic questionnaire, a 20-item knowledge test, and assessments of problems and development needs, feasibility, and satisfaction, together with knowledge and self-care practice assessments for postpartum women. Data were analyzed using descriptive statistics, the one-sample t-test, and the paired t-test with 95% confidence intervals (CI) and Cohen's d, at a significance level of 0.05.

The guideline comprised six components: risk assessment, care during labor, active management of the third stage of labor (AMTSL), surveillance during the first two hours postpartum, assessment and management based on the 4Ts, and handover and continuity of care. After implementation, the mean knowledge score was 17.15 out of 20 (85.77%), which did not differ significantly from the 80% criterion (t=2.02, p=0.066). Among the 32 postpartum women, knowledge scores (11.84 to 16.53 out of 20) and self-care practice scores (3.12 to 4.05 out of 5) were significantly higher after receiving care under the

guideline ($p<0.001$). Development needs ($\bar{x}=3.84$), feasibility ($\bar{x}=3.78$), and satisfaction ($\bar{x}=4.03$) were at a high level and significantly higher than the criterion of 3.40 ($p<0.05$). The guideline was clear, appropriate to the context, feasible, and well accepted. Continuous monitoring of adherence and clinical outcomes, together with a pre–post evaluation using a paired t-test, is recommended.

Keywords: early postpartum hemorrhage, clinical nursing practice guideline, labor room, inferential statistics

Introduction

Postpartum hemorrhage (PPH) is an obstetric emergency and a major cause of maternal death worldwide. The World Health Organization reports that it accounts for 25–30% of maternal deaths, particularly in developing countries, and it can occur in women with or without antecedent risk factors.[1] Early postpartum hemorrhage is defined as blood loss of 500 mL or more after vaginal delivery, or 1,000 mL or more after cesarean section, within the first 24 hours after birth.[2] ACOG and RCOG further emphasize that diagnosis should consider clinical signs, namely changes in vital signs, shock, and the need for transfusion, rather than the volume of blood lost alone.[3,4] The causes are explained by the 4Ts: uterine atony (Tone), the most common cause at 70–80%; genital tract trauma (Trauma), 20%; retained placenta or placental fragments (Tissue), 10%; and coagulopathy (Thrombin), 1%.[5] Despite standard measures such as active management of the third stage of labor (AMTSL), risk assessment, and continuous monitoring of blood loss, PPH still occurs even in women without risk factors; therefore, surveillance systems and practice guidelines suited to the context of each service unit are needed.

Thailand has set the reduction of maternal mortality as a key indicator of the health service system,[6] with a target maternal mortality ratio of no more than 17 per 100,000 live births. Meanwhile, the Thai maternal mortality ratios in 2019–2023 were 22.5, 22.9, 39.8, 25.66, and 21 per 100,000 live births, respectively, and hemorrhage remained the leading cause of obstetric death,[7] especially in community hospitals, which have limited resources and personnel. Ban Dung Crown Prince Hospital, Udon Thani Province, is a 120-bed, level M2 community hospital with one obstetrician and 15 registered nurses assigned to the labor room nursing unit and postpartum ward. Statistics for 2021–2025 show 625, 681, 602, 486, and 467 deliveries and 21, 26, 12, 7, and 4 cases of postpartum hemorrhage, or 3.36%, 3.82%, 1.99%, 1.44%, and 0.85%, respectively.[8] Although the declining trend was statistically significant (chi-square test for trend: $\chi^2=12.62$, df=1, $p<0.001$), medical record review, practice observation, case review, and focus group discussions revealed inconsistent practice between individuals, inconsistent risk assessment and uterine contraction monitoring, incomplete documentation, and unsystematic information handover between the labor room and the postpartum ward, which may affect maternal safety. Note that these figures are unit-level statistics and did not test the effectiveness of any guideline.

Action research following the concept of Kemmis and McTaggart allows practitioners to participate in analyzing problems, designing, piloting, reflecting on, and improving their work through the Plan–Act–Observe–Reflect cycle, which fosters ownership of the guideline and sustainability of change.[9] When integrated with evidence-based practice (EBP),[10] the model of

Rosswurm and Larrabee,[11] Donabedian's framework of quality of care,[12] and guidance from the World Health Organization, ACOG, RCOG, and the Royal Thai College of Obstetricians and Gynaecologists,[1–4,13] it yields a guideline that is academically sound and consistent with the context. Studies in Thailand have found that participatory guideline development enhances team capacity, increases satisfaction, and reduces the incidence of PPH.[14–18] However, the unit has no guideline developed jointly by practitioners on the basis of empirical evidence, leaving a knowledge-to-practice gap. The researchers therefore developed a guideline through action research to raise nurses' knowledge and practice, promote teamwork, and enhance maternal safety, using inferential statistics to assess whether knowledge, feasibility, and satisfaction differed significantly from predefined criteria and to compare the knowledge and self-care practices of postpartum women before and after receiving care under the guideline.

Research Objectives

1) To develop a guideline for the prevention of early postpartum hemorrhage in the labor room of Ban Dung Crown Prince Hospital, Udon Thani Province, using a participatory action research process.
2) To study the outcomes of implementing the guideline for the prevention of early postpartum hemorrhage in the labor room of Ban Dung Crown Prince Hospital, Udon Thani Province.
3) To test the outcomes of guideline implementation, namely knowledge, feasibility, and satisfaction, against predefined criteria using inferential statistics.
4) To compare the knowledge and self-care practices of postpartum women before and after receiving care under the guideline using inferential statistics.

Methods

This study was action research following the Plan–Act–Observe–Reflect cycle[9] combined with evidence-based practice. It was conducted in the labor room nursing unit and the postpartum nursing unit of Ban Dung Crown Prince Hospital, Udon Thani Province, from January to August 2026. The work was divided into three phases: Phase 1, situation analysis and planning (Plan); Phase 2, guideline development and pilot implementation (Act–Observe); and Phase 3, outcome evaluation and reflection (Reflect), as detailed below.

Population and Sample

Population Group 1 : registered nurses working in the labor room nursing unit and the postpartum nursing unit of Ban Dung Crown Prince Hospital during the study period, totaling 13 nurses. **Population Group 2:** women who gave birth in the labor room nursing unit of Ban Dung Crown Prince Hospital during the study period.

Nurse sample. The total population of **13** registered nurses was used, without random sampling, because all staff rotate in caring for women in labor from the waiting stage through delivery and the first **2** hours postpartum, and have a direct role in developing and using the guideline. A sample of **1 3** provides statistical power of **7 5 %** for a large effect size (Cohen's d = **0.80)** and **38%** for a medium effect size (d = **0.50)** at a two-sided significance level of **0.05.**

Postpartum women sample. Thirty-two women were selected by purposive sampling according to the specified criteria. A sample of 32 provides power of approximately 78% for a medium effect size (d = 0.50) and more than 99% for a large effect size (d = 0.80) for the paired t-test at a two-sided significance level of 0.05.

Inclusion criteria for registered nurses: holding a license to practice nursing and midwifery, working in the unit for at least 6 months, being involved in the care of women in labor, and volunteering to participate in the study.

Exclusion criteria for registered nurses: taking study leave or maternity leave, or transferring to another unit during the study; being unable to participate in all phases of activities; or withdrawing from the study.

Inclusion criteria for postpartum women were age 18 years or older, singleton pregnancy, gestational age of at least 37 weeks, vaginal delivery at the study hospital, ability to communicate in Thai, and willingness to participate in the study. **Exclusion criteria for postpartum women** were severe complications requiring immediate referral, inability to complete both assessments, or withdrawal from the study.

Research Instruments

The instruments comprised: 1) the intervention instrument, namely the guideline for the prevention of early postpartum hemorrhage in the labor room with six components (risk assessment, care during labor, delivery care according to AMTSL, surveillance during the first 2 hours postpartum, assessment and management according to the 4Ts, and handover and continuity of care), linked to a risk assessment form, a flowchart, and an audit checklist; and 2) data collection instruments, namely (1) a demographic questionnaire; (2) a 20-item multiple-choice knowledge test with four options per item, with a full score of 20; (3) a 20-item assessment of problems and development needs on a 5-point rating scale; (4) a feasibility assessment; and (5) a satisfaction assessment on a 5-point rating scale. Mean scores were interpreted as follows: 1.00–1.80 lowest, 1.81–2.60 low, 2.61–3.40 moderate, 3.41–4.20 high, and 4.21–5.00 highest. Quality was verified by three experts (an obstetrician, a nursing instructor in midwifery, and an expert nurse), yielding an IOC of 0.67–1.00 (criterion ≥0.50); the guideline had an S-CVI of 0.95 (criteria: I-CVI ≥0.78 and S-CVI ≥0.90). The reliability of the knowledge test (KR-20) was 0.78, and Cronbach's alpha for the rating scales was 0.86–0.92 (criterion ≥0.70).

Data collection instruments for postpartum women were (1) a demographic questionnaire; (2) a 20-item multiple-choice knowledge assessment on the prevention of postpartum hemorrhage and postpartum self-care, with a full score of 20; and (3) a 10-item self-care practice assessment on a 5-point rating scale, interpreted using the same criteria as above. Quality was verified by three experts, yielding an IOC of 0.67–1.00. The reliability of the knowledge test (KR-20) was 0.76, and Cronbach's alpha for the self-care practice assessment was 0.84.

Data Collection

Phase 1: the researchers reviewed medical records, observed practice, held case review meetings and focus groups, and collected demographic data, problems, and development needs. Phase 2: evidence was searched for and synthesized, and the guideline was drafted with the co-researchers, validated by experts, introduced through training, and piloted in clinical practice for 8 weeks. Phase 3: knowledge, feasibility, and satisfaction were assessed after implementation, and a reflection meeting was held to improve the guideline. The researchers collected all data themselves.

For postpartum women, the researchers assessed knowledge and self-care practices before care under the guideline (pre-test) and reassessed them after care under the guideline, before hospital discharge (post-test), using the

same instrument. The researchers collected all data themselves.

Data Analysis

Descriptive statistics comprised frequency, percentage, mean, standard deviation, median, and range. Qualitative data were analyzed by content analysis. For inferential statistics, the one-sample t-test was used to compare mean scores for development needs, feasibility, and satisfaction against the criterion of 3.40 (the upper limit of the moderate level), and knowledge scores against the criterion of 80% (16 of 20 points), with the null hypothesis H0: μ = criterion value and the alternative hypothesis H1: $\mu \neq$ criterion value (two-sided). The t value, df, p-value, 95% CI of the mean, and Cohen's d were reported. Normality was checked with the Shapiro-Wilk test, and the Wilcoxon signed-rank test was used when the assumptions were not met. The annual trend in PPH incidence was tested with the chi-square test for trend. Knowledge and self-care practice scores of postpartum women before and after receiving care under the guideline were compared with the paired t-test (df = 31), with the null hypothesis H0: $\mu d = 0$ and the alternative hypothesis H1: $\mu d \neq 0$ (two-sided). The mean difference, t value, p-value, 95% confidence interval (95% CI) of the difference, and effect size (Cohen's d) were reported. Normality of the differences was checked with the Shapiro-Wilk test. The level of statistical significance was set at 0.05.

Research Ethics

The researchers observed the ethical principles of research involving human participants. Co-researchers were informed of the objectives, procedures, and their right to participate or withdraw at any time without any effect on their work, and signed informed consent before participating. Postpartum women were likewise informed and signed informed consent before participating. Individual data were kept confidential and presented only in aggregate.

Results

1. Results of developing the guideline for the prevention of early postpartum hemorrhage in the labor room

1.1 General information of co-researchers The 13 registered nurse co-researchers had a mean age of 36.23±7.70 years (median 37 years, range 27–51 years). Most held a bachelor's degree (92.3%), were at the professional level (69.2%), had more than 15 years of service (38.5%), had 6–10 years of experience in labor nursing (38.5%), and had previously received related training (69.2%), as shown in Table 1.

1.2 Problems before guideline development The overall mean problem score was 2.38 (low level). The highest-scoring issue was insufficient staff knowledge about PPH ($\bar{x}$=2.77, S.D.=1.17), followed by unsystematic postpartum outcome monitoring ($\bar{x}$=2.62, S.D.=1.12), both at the moderate level. The lowest was the absence of a clear manual or guideline ($\bar{x}$=2.08, S.D.=0.95). This indicates that the main problems lay in knowledge, outcome monitoring, and consistency in applying practice standards, as shown in Table 2.

1.3 Need for guideline development The overall mean need for development was 3.84 (high level). The highest was the use of a common guideline across the unit ($\bar{x}$=4.15, S.D.=1.07), followed by an outcome monitoring system ($\bar{x}$=4.08, S.D.=1.04) and training/knowledge enhancement ($\bar{x}$=4.00, S.D.=1.00). The three lowest items ($\bar{x}$=3.69) were still at the high level, as shown in Table 3, and the overall mean was

significantly higher than the high-level criterion (3.40) (p=0.025), as shown in Table 8.

1.4 Development process and the resulting guideline The guideline was developed through the three phases of the action research cycle, as shown in Table 4. The resulting guideline had six components: 1) risk assessment from admission through labor/delivery to the postpartum period, covering factors such as previous postpartum hemorrhage, fourth or later pregnancy, multiple pregnancy or polyhydramnios, macrosomia (EFW >3,500 g), previous uterine surgery, BMI >30, induction or augmentation of labor, prolonged labor, and receipt of MgSO4 or terbutaline; 2) care during labor; 3) delivery care according to AMTSL, namely giving oxytocin 5 units intravenously at delivery of the anterior shoulder, followed by an intravenous infusion containing oxytocin 20 units at 120 mL/hr, inspection of the birth canal, placenta, membranes, and umbilical cord, uterine massage and assessment of contraction, and assessment of the bladder; 4) surveillance during the first 2 hours postpartum, with responses defined by blood loss (300 mL as a warning sign, 500–999 mL, and 1,000–1,500 mL) and referral to Udon Thani Regional Hospital when blood loss exceeds 1,500 mL; 5) assessment and management according to the 4Ts; and 6) handover and continuity of care, linked to the flowchart and audit checklist.

2. Outcomes of implementing the guideline for the prevention of early postpartum hemorrhage

2.1 Knowledge of prevention of early postpartum hemorrhage After guideline implementation, the mean knowledge score was 17.15 out of 20 (85.77%). Six items were answered correctly by every nurse (items 3, 5, 8, 9, 11, and 19), whereas the items with the fewest correct answers (53.8%) were item 10, the interval for postpartum vital sign assessment, and item 13, the major complications of PPH, as shown in Table 5. The mean score did not differ significantly from the 80% criterion (16 points) (p=0.066), as shown in Table 8.

2.2 Feasibility of implementing the guideline The overall mean was 3.78 (high level). The highest were clarity of the guideline and readiness of resources, equipment, and personnel (both $\bar{x}$=3.85), and the lowest was appropriateness of the time required ($\bar{x}$=3.69), which was still at the high level, as shown in Table 6. The overall mean was significantly higher than the high-level criterion (3.40) (p=0.028), as shown in Table 8.

2.3 Satisfaction of registered nurses with using the guideline The overall mean was 4.03 (high level). The highest was usefulness of the guideline for work ($\bar{x}$=4.15), followed by clarity and ease of the steps and confidence in caring for women in labor (both $\bar{x}$=4.08). The lowest was the presentation format and convenience of use in real situations ($\bar{x}$=3.92), as shown in Table 7. The overall mean was significantly higher than the high-level criterion (3.40) (p<0.001), as shown in Table 8.

2.4 Inferential statistical testing The one-sample t-test (df = 12), shown in Table 8, found that development needs ($\bar{x}$=3.84; t=2.56, p=0.025, 95% CI = 3.47–4.21, d=0.71), feasibility ($\bar{x}$=3.78; t=2.49, p=0.028, 95% CI = 3.45–4.11, d=0.69), and satisfaction ($\bar{x}$=4.03; t=4.73, p<0.001, 95% CI = 3.74–4.32, d=1.31) were significantly higher than the high-level criterion (3.40) at the 0.05 level, with medium to large effect sizes. Knowledge scores ($\bar{x}$=17.15) did not differ from the 80% criterion, or 16 points (t=2.02, p=0.066, 95% CI = 15.91–18.39, d=0.56). Because the 95% confidence interval included the criterion value, it cannot be concluded that knowledge was

higher than the criterion, which may relate to the small sample and limited statistical power.

3. Outcomes in postpartum women after receiving care under the guideline for the prevention of early postpartum hemorrhage

3.1 General information of postpartum women The 32 postpartum women in the sample had a mean age of 27.41±5.62 years (range 18–39 years). Most had less than a bachelor's degree education (65.6%), were in a subsequent pregnancy (56.3%), and had a normal vaginal delivery (84.4%); 28.1% had risk factors for postpartum hemorrhage, as shown in Table 9.

3.2 Inferential testing of knowledge and self-care practices of postpartum women The paired t-test (df = 31), shown in Table 10, with normally distributed differences (Shapiro-Wilk $p>0.05$), found that the mean knowledge score after care under the guideline ($\bar{x}$=16.53, S.D.=2.11) was significantly higher than before care ($\bar{x}$=11.84, S.D.=2.76) at the 0.05 level, with a mean difference of 4.69 points (t=8.56, p<0.001, 95% CI = 3.57–5.81, d=1.51). The mean self-care practice score after care ($\bar{x}$=4.05, S.D.=0.46, high level) was also significantly higher than before care ($\bar{x}$=3.12, S.D.=0.58, moderate level), with a mean difference of 0.93 points (t=8.22, p<0.001, 95% CI = 0.70–1.16, d=1.45). The effect sizes for both variables were large, and the 95% confidence intervals of the differences did not include zero, indicating that the women's knowledge and self-care practices improved after receiving care under the guideline.

Table 1 General information of the registered nurse co-researchers (n = 13)

General information	Number (persons)	Percent
Age (years) $\bar{x}$±S.D.	36.23±7.70	
Median (min–max)	37 (27–51)	
Education level		
Bachelor's degree	12	92.3
Master's degree	1	7.7
Position		
Registered Nurse, Practitioner Level	4	30.8
Registered Nurse, Professional Level	9	69.2
Length of service		
1–5 years	3	23.1
6–10 years	2	15.4
11–15 years	3	23.1
More than 15 years	5	38.5
Experience in labor nursing		
Less than 1 year	2	15.4
1–5 years	4	30.8
6–10 years	5	38.5
11–15 years	0	0.0
More than 15 years	2	15.4
Training in labor care/PPH prevention		
Yes	9	69.2
No	4	30.8

Table 2 Problems in the prevention of early postpartum hemorrhage before guideline development (n = 13)

Problem	$\bar{x}$	S.D.	Level
1. Insufficient staff knowledge about PPH	2.77	1.17	Moderate
2. Postpartum outcome monitoring is not systematic	2.62	1.12	Moderate
3. Risk assessment for postpartum hemorrhage is not systematic	2.46	1.33	Low
4. Emergency preparedness is inadequate	2.46	0.88	Low
5. Care documentation is not standardized	2.38	0.96	Low
6. Blood loss estimation is inaccurate	2.31	1.03	Low
7. Team communication/handover is unclear	2.31	1.11	Low
8. Postpartum hemorrhage surveillance is not comprehensive	2.23	0.93	Low
9. Staff follow differing practice approaches	2.15	1.07	Low
10. No clear manual or guideline	2.08	0.95	Low
Overall	**2.38**	-	**Low**

Table 3 Needs for developing the guideline for the prevention of early postpartum hemorrhage (n = 13)

Development needs	$\bar{x}$	S.D.	Level
1. Need for a common guideline across the unit	4.15	1.07	High
2. Need for an outcome monitoring system	4.08	1.04	High
3. Need for training/knowledge enhancement	4.00	1.00	High
4. Need for a clear guideline	3.77	1.09	High
5. Need for guidance when risks occur	3.77	1.09	High
6. Need for a practice manual	3.77	1.09	High
7. Need for a recording and monitoring system	3.77	1.17	High
8. Need for a standardized risk assessment approach	3.69	1.03	High
9. Need for a postpartum hemorrhage surveillance approach	3.69	1.03	High
10. Need for a system ready for risk assessment	3.69	0.85	High
Overall	**3.84**	-	**High**

Table 4 Guideline development process following the action research cycle

Phase	Activities/content	Instruments used	Duration	Academic rationale
1. Situation analysis and planning (Plan)	Reviewed PPH statistics and medical records for 2021–2025, observed practice, held case review meetings and focus groups, and assessed problems and development needs	Demographic questionnaire, problem and development needs assessment, focus group question guide	8 weeks (Jan–Feb 2026)	Action research cycle of Kemmis and McTaggart; problem analysis step of Rosswurm and Larrabee

Phase	Activities/content	Instruments used	Duration	Academic rationale
2. Guideline development and pilot implementation (Act–Observe)	Searched for and synthesized evidence from WHO, ACOG, RCOG, and the Royal Thai College of Obstetricians and Gynaecologists; drafted a six-component guideline; expert validation; training and orientation; piloted and observed practice	Guideline, risk assessment form, flowchart, and audit checklist	16 weeks (Mar–Jun 2026)	Evidence-based practice of Melnyk and Fineout-Overholt; AMTSL and 4Ts principles
3. Outcome evaluation and reflection (Reflect)	Assessed knowledge, feasibility, and satisfaction; held a reflection meeting and refined the guideline into a unit standard	Knowledge test, feasibility assessment, and satisfaction assessment	8 weeks (Jul–Aug 2026)	Donabedian's framework of quality of care (structure–process–outcome)

Table 5 Number and percentage of registered nurses answering each knowledge item correctly (n = 13)

Item	Correct (persons)	Percent
1. Definition of PPH after vaginal delivery ≥500 mL	12	92.3
2. Early PPH occurs within 24 hours	12	92.3
3. The most common cause is poor uterine contraction	13	100.0
4. 4Ts: Tone means poor uterine contraction	12	92.3
5. The first-line drug recommended for PPH prevention is oxytocin	13	100.0
6. Timing of oxytocin administration to prevent PPH	11	84.6
7. Meaning of AMTSL	12	92.3
8. Purpose of uterine massage after delivery	13	100.0
9. Major risk factors for PPH	13	100.0
10. Interval for postpartum vital sign assessment	7	53.8
11. Major warning signs of PPH	13	100.0
12. Method of postpartum uterine assessment	10	76.9
13. Major complications of PPH	7	53.8
14. Purpose of calculating blood loss	10	76.9
15. When risk assessment should be performed	10	76.9
16. Risk category of anemia	10	76.9
17. Outcome that clinical practice guidelines help achieve	12	92.3
18. Key persons in PPH surveillance	10	76.9
19. Appropriate response when risks are identified	13	100.0
20. Key goal of PPH prevention	10	76.9
Overall mean score (full score 20)	**17.15**	**85.77**

Table 6 Feasibility of implementing the guideline (n = 13)

Item	$\bar{x}$	S.D.	Level
1. Clarity of the guideline enabling correct adherence	3.85	0.80	High
2. Readiness of resources, equipment, and personnel to support adherence	3.85	0.69	High
3. Convenience of applying the guideline steps in real work settings	3.77	0.83	High
4. Ability to sustain use of the guideline in practice	3.77	1.17	High
5. Appropriateness of the time required to follow the guideline	3.69	0.85	High
Overall	**3.78**	-	**High**

Table 7 Satisfaction of registered nurses with using the guideline (n = 13)

Item	$\bar{x}$	S.D.	Level
1. Usefulness of the guideline for work	4.15	0.55	High
2. Steps are clear and easy to follow	4.08	0.64	High
3. Confidence in caring for women in labor after implementing the guideline	4.08	0.76	High
4. Guideline content is complete and useful	4.00	0.58	High
5. Presentation format is appropriate and easy to understand	3.92	0.64	High
6. Convenience of using the guideline in real situations	3.92	0.64	High
Overall	**4.03**	-	**High**

Table 8 Testing of mean outcomes against criterion values using inferential statistics (n = 13)

Variable	$\bar{x}$	S.D.	d	t	95% CI	p-value
Development needs	3.84	0.62	0.71	2.56	3.47–4.21	0.025*
Knowledge (full score 20)	17.15	2.05	0.56	2.02	15.91–18.39	0.066
Feasibility	3.78	0.55	0.69	2.49	3.45–4.11	0.028*
Satisfaction	4.03	0.48	1.31	4.73	3.74–4.32	<0.001*

Note: *Statistically significant ($p < 0.05$)

Table 9 General information of the postpartum women in the sample (n = 32)

General information	Number (persons)	Percent
Age (years) $\bar{x}$±S.D.	27.41±5.62	
Min–max	18–39	
Education level		
Below bachelor's degree	21	65.6
Bachelor's degree or higher	11	34.4
Pregnancy order		
First pregnancy	14	43.8
Subsequent pregnancy	18	56.3
Mode of delivery		
Normal vaginal delivery	27	84.4

Obstetric procedure-assisted delivery	5	15.6
Risk factors for postpartum hemorrhage		
Present	9	28.1
Absent	23	71.9

Table 10 Inferential comparison of knowledge and self-care practice scores of postpartum women before and after receiving care under the guideline (n = 32)

Variable	Before ($\bar{x}$±S.D.)	After ($\bar{x}$±S.D.)	Mean difference (95% CI)	t	d	p-value
Knowledge (full score 20)	11.84±2.76	16.53±2.11	4.69 (3.57–5.81)	8.56	1.51	<0.001*
Self-care practice (full score 5)	3.12±0.58	4.05±0.46	0.93 (0.70–1.16)	8.22	1.45	<0.001*

Note: *Statistically significant at the 0.05 level

Discussion

Regarding guideline development (objective 1), the problems with the highest means were insufficient staff knowledge about PPH ($\bar{x}$=2.77) and unsystematic outcome monitoring ($\bar{x}$=2.62), while the lowest was the absence of a clear manual or guideline ($\bar{x}$=2.08). This indicates that the unit's key issues are the gap between knowledge and actual practice, consistent application of standards, outcome monitoring, and team communication. The highest need was for a common guideline across the unit ($\bar{x}$=4.15), because PPH care requires rapid response and teamwork, and a common standard reduces variability in assessment and decision-making. This is consistent with Forbes et al.,[21] who found that barriers to detecting and managing PPH in Kenya, Nigeria, and South Africa included shortages of personnel and resources, limited training, and inconsistent use of guidelines, and with Pojana et al.,[14] who used participatory action research to develop a risk assessment form and PPH prevention guideline that enhanced the capacity of the multidisciplinary team. The six-component guideline therefore responds directly to the unit's problems and needs.

Regarding knowledge (objective 2), the mean score after guideline implementation was 17.15 out of 20, which may be attributable to the guideline being developed from empirical evidence, practitioners' participation in its development and piloting, and 69.2% of co-researchers having previously received training. The items answered correctly least often were the interval for vital sign assessment and the major complications of PPH (53.8%), possibly because they require recalling time-related details and linking complications to clinical changes. This is consistent with Coelho et al.,[19] who found that simulation training of 37 nurses raised knowledge scores from 65% to 90%, and Faustine et al.,[20] who found that simulation-based learning significantly increased the knowledge and skills of student nurse-midwives (p<.001). It supports the view that using the guideline together with continued practice drills will help sustain knowledge and improve staff readiness.

Regarding feasibility and satisfaction, overall feasibility was at the high level ($\bar{x}$=3.78), with clarity of the guideline and readiness of resources highest ($\bar{x}$=3.85) and appropriateness of the time required lowest ($\bar{x}$=3.69), which may reflect the workload and urgency of the labor

room. This is consistent with Kulnit et al.,[18] who found feasibility at the highest level, and Promchan et al.,[17] who found feasibility of 95.45% and a significant reduction in PPH incidence. Overall satisfaction was at the high level ($\bar{x}$=4.03), with usefulness for work highest ($\bar{x}$=4.15), indicating that a guideline that clearly sequences assessment, prevention, and response reduces uncertainty and increases practitioners' confidence. This is consistent with Wongwattanakan and Promthat,[16] who found satisfaction at the highest level and no postpartum hemorrhage in the group that piloted the guideline, and Luangkwan et al.,[15] who found satisfaction at the highest level and a PPH rate that fell from 18.9% to 3.9%.

Regarding inferential statistics, development needs, feasibility, and satisfaction were significantly higher than the high-level criterion (3.40) ($p<0.05$), with satisfaction showing the largest effect size ($d=1.31$), suggesting that the findings are unlikely to be due to random variation alone. This is consistent with studies reporting statistical significance after learning or use of guidelines.[19,20] The knowledge score did not differ from the 80% criterion ($p=0.066$), and its 95% confidence interval (15.91–18.39) was fairly wide, so the result can be interpreted only as uncertain, not as evidence that knowledge was inadequate, because the statistical power of a sample of 13 is limited. In addition, statistical significance is not equivalent to clinical importance, and the tests compared scores with predefined criteria rather than comparing nurses before and after, so it cannot yet be inferred that the guideline caused the outcomes.

For postpartum women, after receiving care under the guideline, the 32 women had knowledge scores ($\bar{x}$=16.53, S.D.=2.11) and self-care practice scores ($\bar{x}$=4.05, S.D.=0.46) significantly higher than before care ($\bar{x}$=11.84 and 3.12, respectively) ($p<0.001$), with large effect sizes ($d=1.51$ and $d=1.45$) and 95% confidence intervals of the differences that did not include zero. This may be explained by the guideline's requirement for systematic risk assessment, information provision, and communication with postpartum women, which helped them understand warning signs and practice self-care more correctly. However, because this was a single-group pre–post comparison without a control group, the results should be interpreted with caution, as they may be related to information from other sources, experiences during childbirth, and retesting with the same instrument.

Limitations This study had a small sample and was conducted in a single service unit. Nurses' knowledge scores were not collected before guideline implementation, so it cannot be concluded statistically that knowledge increased, and maternal clinical outcomes such as PPH incidence and blood loss were not evaluated. The inferential analyses had low statistical power, wide confidence intervals, and potentially unstable p-values; normality tests have low sensitivity; multiple tests without adjustment of the significance level may increase the risk of type I error; and one-sample t-tests against criteria should not be cited as evidence of the guideline's effectiveness. Generalization to other populations should therefore be done with caution. For postpartum women, the study was a single-group pre–post comparison without a comparison group and may have been influenced by a testing effect, so the increases in knowledge and self-care practices should not be attributed to the guideline alone.

Conclusions

The guideline for the prevention of early postpartum hemorrhage in the labor room,

developed through the action research cycle, comprises six components: risk assessment, care during labor, delivery care according to AMTSL, surveillance during the first 2 hours postpartum, assessment and management according to the 4Ts, and handover and continuity of care. After implementation, nurses' knowledge was fairly high (17.15 out of 20), and feasibility and satisfaction were at the high level, indicating that the guideline is clear, appropriate to the context, and practicable. Development needs, feasibility, and satisfaction were significantly higher than the high-level criterion ($p<0.05$), whereas knowledge did not differ from the 80% criterion ($p=0.066$), which should be confirmed by comparative studies with an adequate sample size. Among the 32 postpartum women, knowledge and self-care practice scores after receiving care under the guideline were significantly higher than before ($p<0.001$).

Recommendations

1. Recommendations for applying the findings The guideline should be established as a common standard for the labor room nursing unit and postpartum ward; knowledge should be refreshed and simulation drills held periodically, emphasizing postpartum vital sign assessment and the major complications of PPH; the guideline format should be made more concise, for example as a flowchart, checklist, and trigger tool, to reduce time constraints; and results should be reported as confidence intervals and effect sizes alongside p-values.

2. Recommendations for future research Future studies should design pre–post evaluations in the same participants using the paired t-test or Wilcoxon signed-rank test according to data distribution; increase the sample size and number of service units (with an a priori power analysis, e.g., $\alpha=0.05$, power=0.80); include a comparison group among postpartum women; follow up for at least 6–12 months; and add clinical outcomes such as blood loss, PPH incidence, transfusion, shock, referral, and length of hospital stay, considering a mixed-effects model when data come from multiple service units or time points.

Acknowledgments

The researchers would like to thank the director of Ban Dung Crown Prince Hospital, nursing administrators, the obstetrician, the experts, and all related staff who provided advice, supplied data, and facilitated the research. We also thank all registered nurses in the labor room and postpartum nursing units who took part in analyzing problems and in developing, piloting, evaluating, and reflecting on the guideline, as well as the mothers and families who received services, whose data and care experiences contributed greatly to the quality and safety of the service system.

References

1. World Health Organization. A roadmap to combat postpartum haemorrhage between 2023 and 2030. Geneva: World Health Organization; 2023.
2. World Health Organization. WHO recommendations on the assessment of postpartum blood loss and use of a treatment bundle for postpartum haemorrhage. Geneva: World Health Organization; 2023.
3. American College of Obstetricians and Gynecologists. Practice Bulletin No. 183: Postpartum hemorrhage. Obstet Gynecol. 2017;130(4):e168-86.

4. Royal College of Obstetricians and Gynaecologists. Prevention and management of postpartum haemorrhage (Green-top Guideline No. 52). London: RCOG; 2016.
5. Cunningham FG, Leveno KJ, Dashe JS, Hoffman BL, Spong CY, Casey BM. Williams obstetrics. 26th ed. New York: McGraw Hill; 2022.
6. Ministry of Public Health. Maternal mortality reduction plan 2023–2027. Nonthaburi: Ministry of Public Health; 2023. (in Thai)
7. Bureau of Reproductive Health, Department of Health. Maternal and child health situation report of Thailand 2024. Nonthaburi: Department of Health; 2024. (in Thai)
8. Labor Room Nursing Unit, Ban Dung Crown Prince Hospital. Statistics of parturients 2024–2026. Udon Thani: Ban Dung Crown Prince Hospital; 2026. (in Thai)
9. Kemmis S, McTaggart R. The action research planner. 3rd ed. Geelong: Deakin University Press; 1988.
10. Melnyk BM, Fineout-Overholt E. Evidence-based practice in nursing & healthcare: a guide to best practice. 5th ed. Philadelphia: Wolters Kluwer; 2023.
11. Rosswurm MA, Larrabee JH. A model for change to evidence-based practice. Image J Nurs Sch. 1999;31(4):317-22.
12. Donabedian A. The quality of care: how can it be assessed? JAMA. 1988;260(12):1743-8.
13. Royal Thai College of Obstetricians and Gynaecologists. Clinical practice guideline: prevention and management of postpartum hemorrhage. Bangkok: RTCOG; 2023. (in Thai)
14. Pojana W, Chaiwongsa K, Somchok P. Development of a risk assessment form and nursing practice guideline for prevention of early postpartum hemorrhage through knowledge management, Sawang Daen Din Crown Prince Hospital. Journal of Research and Development in Health System. 2021;14(2):182-94. (in Thai)
15. Luangkwan S, Tupimai B, Chomngam S, Loyden T. Development of clinical nursing practice guideline for prevention of early postpartum hemorrhage in mothers with vaginal delivery, Buriram Hospital. Medical Journal of Srisaket Surin Buriram Hospitals. 2021;36(3):617-29. (in Thai)
16. Wongwattanakan J, Promthat P. Development of practice guideline for prevention of early postpartum hemorrhage in labor room, Bamrasnaradura Infectious Diseases Institute. Nonthaburi: Bamrasnaradura Infectious Diseases Institute; 2022. (in Thai)
17. Promchan S, Samutjak N, Kaewjaiboon J. Effects of using nursing practice guideline for prevention of postpartum hemorrhage within 2 hours after delivery. Journal of Nursing and Health Research. 2021;22(2):69-81. (in Thai)
18. Kulnit R, Phan-ngam N, Khamwilaisak R, Panphet N, Yathongchai S. Development of a nursing practice guideline for prevention of postpartum hemorrhage during 2–24 hours after delivery at postpartum and newborn ward 2Kh, Srinagarind Hospital: a feasibility study. Journal of Nursing Science & Health. 2025;48(1):30-47. (in Thai)
19. Coelho TS, Fonseca LMM, Cardoso MVLML, Aquino PS, Costa CC, Maciel NS, et al. Clinical simulation for nurses' knowledge on postpartum hemorrhage: a randomized clinical trial. Rev Bras Enferm. 2025;78(Suppl 1):e20240214. doi:10.1590/0034-7167-2024-0214
20. Faustine R, Tjoflåt I, Risa ECF, Rogathi J, Mahande MJ. Improving Tanzanian student nurse-midwives' knowledge, skills and attitude in postpartum hemorrhage prevention through simulation-based education: a pre-post quasi experimental study. BMC Pregnancy Childbirth. 2025;25:471. doi:10.1186/s12884-025-07590-4

Forbes G, Akter S, Miller S, Galadanci H, Qureshi Z, Fawcus S, et al. Factors influencing postpartum haemorrhage detection and management and the implementation of a new postpartum haemorrhage care bundle (E-MOTIVE) in Kenya, Nigeria, and South Africa. Implement Sci. 2023;18(1):1. doi:10.1186/s13012-022-01253-0