Multifaceted Intervention to Improve the Quality of Care for Postpartum Hemorrhage

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ABSTRACT

Objective: To evaluate the effect of a multifaceted intervention on the quality of care and clinical outcomes for postpartum hemorrhage (PPH) as measured by adherence and acceptability to indicators of PPH management at district and referral levels.

Methods: A quasi-experimental study of interventions was conducted to improve healthcare for PPH in 6 district and 3 referral hospitals in southern Thailand. Multifaceted intervention included educational outreach, audit and feedback, reminders, and the involvement of an opinion leader. Physicians and nurses responsible for case management and care policies (145 individuals) in the aforementioned hospitals participated in the intervention. Medical records were reviewed considering the checklist of indicators for district and referral levels.

Results: All indicators for PPH management were accepted by at least 80% of the participants, except for surgical intervention. We reviewed the medical records of 805 women diagnosed with PPH. Of these, during the pre- and post-intervention periods, 132 and 142 were from district hospitals, and 228 and 303 from referral hospitals, respectively. The use of an indwelling bladder catheter and hemodynamic monitoring were significantly increased in the post-intervention period.

Conclusion: Quality of care for postpartum hemorrhage improved after implementing a multifaceted intervention targeting healthcare providers. The results of this study can be applied to other hospitals with a similar setting regarding the eligible criteria. Severe maternal morbidity and mortality from PPH should be monitored.

Keywords: Indicator; multifaceted intervention; postpartum hemorrhage; quality of care (Siriraj Med J 2020; 72: 24-32)

INTRODUCTION

Postpartum hemorrhage (PPH), defined as a blood loss of 500 mL or more within 24 h following parturition, is a common obstetric complication contributing to maternal near-miss morbidity and mortality.[1] A systematic review of the literature showed that PPH is a leading cause of maternal death in developed countries.[2] The global prevalence of hemorrhage in maternal deaths was reported as 13.4%, but 10%-20% in Thailand.[3] The World Health Organization (WHO) updated the guidelines for PPH prevention and treatment in 2012 focusing on uterine atony and a retained placenta, which are the most common causes of PPH.[4] However, these guidelines are recommended practices in general and are not focused on hospital contexts in particular. As a result, the guidelines are not used efficiently and clinical

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Received 20 March 2019 Revised 8 November 2019 Accepted 11 November 2019
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http://dx.doi.org/10.33192/Smj.2020.04

practice based on evidence-based guidelines remains a challenge.[5] Moreover, the translation of knowledge into action is limited in most developing countries.[6]

Although evidence-based guidelines for best practice to prevent and treat PPH have been promoted,[4,7] these practice guidelines are not always adhered to appropriately.[8-10] To improve the adherence to standard practices, indicators are an important tool to aid evaluating and monitoring quality improvement.[11] Scientific evidence for developing appropriate indicators to improve the quality of care is essential.[12] Acceptability of the indicators by healthcare providers is vital to develop appropriate indicators to measure the quality of a process.[13–14] We previously developed process indicators for PPH management for district- and referral-level hospitals from the evidence-based guidelines, which a healthcare provider agreed were feasible to monitor.[15] The report of a study conducted in The Netherlands described the development of quality indicators to prevent and manage PPH, but their ultimate indicators differed from those in our present study.[16] A systematic review found that didactic traditional continuing medical education or mailing the dissemination of knowledge alone did not change the behavior of healthcare professionals significantly.[17] Therefore, comprehensive methods should be used to introduce to healthcare providers the practice of implementing and correctly utilizing indicators.

A clinical audit is a commonly used method to reduce the frequency of severe complications and improve the management of PPH.[18,19] However, it has been argued that conducting an audit alone is not sufficient to change the practice of medical professionals and that the use of multiple approaches, known as a multifaceted intervention, including audit and feedback, educational outreach, the involvement of opinion leaders, and reminders, is effective.[20,21] Multifaceted intervention has also been reported as an effective strategy to improve the adherence to standard practice related to PPH.[20] However, there are a variety of interventions that influence the clinical practice depending on the context of the facilities.[21] Therefore, the present study aimed to evaluate the effect of a multifaceted intervention on the quality of care for PPH as measured by the adherence and acceptability to management indicators as well as the clinical outcomes at the district and referral levels.

MATERIALS AND METHODS

Study design and context

We conducted a quasi-experimental before-and-after study in Songkhla province, southern Thailand, which has various hospital levels and contexts, to assess the change of practice related to PPH based on management indicators. This study was approved by the Institutional Ethics Committee of the Faculty of Medicine, Prince of Songkla University (approval No. 53-108-18-1-3) and the Ethical Review Committee for Research in Human Subjects, Ministry of Public Health, Thailand (Si 45/2010) in June 2010. All the physicians and nurses participated in the study were informed and signed their consent.

A total of 9 hospitals, including 3 referral hospitals (a university, a regional, and a provincial hospital) and 6 district hospitals in Songkhla province, with a previous record of at least 30 deliveries per month and the highest complications in the province, were chosen to acquire sufficient cases of PPH. The obstetricians and the general doctors had responsibilities as the team leaders at the referral and provincial hospital, respectively. Although guidelines for PPH management existed in the participating hospitals, they were described variously, and unmonitored. A checklist of indicators, which were considered feasibly relevant, measurable, and improvable, was used to audit PPH management. Details of the development process, reliability, and validity are described in our previously published manuscript.[15]

The indicators for district hospitals included a correct diagnosis of PPH, and general management, such as the administration of intravenous fluids, monitoring of vital signs, and use of an indwelling bladder catheter. For referral hospitals, blood cross-matching was added as an indicator of general management. Specific management indicators common to both hospital levels included performing a uterine massage and providing oxytocin or methylergometrine in the case of uterine atony and after removal of the placenta in the case of a retained placenta. Prostaglandin E2, surgical and radiological interventions for uterine atony, and removal of the placenta under general anesthesia were additionally indicated at the referral level.

Intervention

The intervention included educational outreach, audit and feedback, reminders, and the involvement of an opinion leader from August to September 2010. Before educational outreach, an audit was conducted by reviewing the medical records of women with PPH in the participating hospitals. Then the research team visited the study hospitals to give information on the magnitude of PPH and the need for prompt appropriate PPH management. In addition, feedback on the audit information related to PPH management and the outcomes of practice based on the indicators was provided to healthcare providers in this educational outreach visit. In addition, a chart of quality indicators was placed in

the labor room, postpartum ward, and emergency room as a reminder of the PPH guidelines. These activities were facilitated by the opinion leaders in the hospitals.

Data collection

The medical records of women with PPH who had delivered in the participating hospitals from October 2008 to September 2009 (pre-intervention period) were audited by 2 standardized researchers using an indicator checklist. Then, educational outreach activities were conducted in each participating hospital during August and September 2010. All the physicians and nurses who were mainly responsible for the management of PPH at each hospital were invited to participate in the study. Discussions on each indicator for the management of PPH, and the challenges with possible solutions were recorded. After the intervention, the medical records of women with PPH who had delivered between October 2010 to September 2011 (post-intervention period) were audited by the same researchers using the same checklist. A diagram of the study flow and time frame is shown in Fig 1.

Variables

Information on the healthcare providers participating in the intervention, including gender, age, occupational status, and duration of work experience, were collected. The acceptability of each indicator was determined using a constructed self-administered questionnaire. The acceptability was assessed as "the degree to which they would accept the indicator in their practice" and was measured using a 5-item Likert-type rating scale, ranging from strongly unacceptable to strongly acceptable. Patient characteristics, including maternal age, parity, gestational age at delivery, and route of delivery, were recorded. Practicing each indicator was evaluated as "yes", "no", or "no data". Maternal outcomes, such as amount of blood loss in 24 h after delivery, receiving a blood transfusion, shock, hysterectomy, length of hospital stay, and referral status, were assessed. Neonatal outcomes included Apgar score < 7 at 5 min and NICU admission.

Data analysis

The sample size for the study was based on a target for improvement defined as 90% adherence to each indicator, compared with an average baseline adherence of 70% at the district level and 80% at the referral level in the pre-intervention period,[9] with a 95% confidence interval and a power of 80%. At least 72 medical records of PPH at the district level and 219 at the referral level were required for before and after the intervention.

The data were entered in EpiData Entry, version 3.1 (Lauritsen JM and Bruus MA, a comprehensive tool for the validated entry and documentation of data. The EpiData Association, Odense Denmark, 2008), and analyzed using R, version 2.10.0 (R Foundation for Statistical Computing, Vienna, Austria). The acceptability was analyzed descriptively by hospital level. The maternal characteristics, adherence to practice of each indicator, and maternal and neonatal clinical outcomes were compared before and after the intervention by hospital level using a univariate analysis. $P < 0.05$ was considered as significant in the tests of statistical inference.

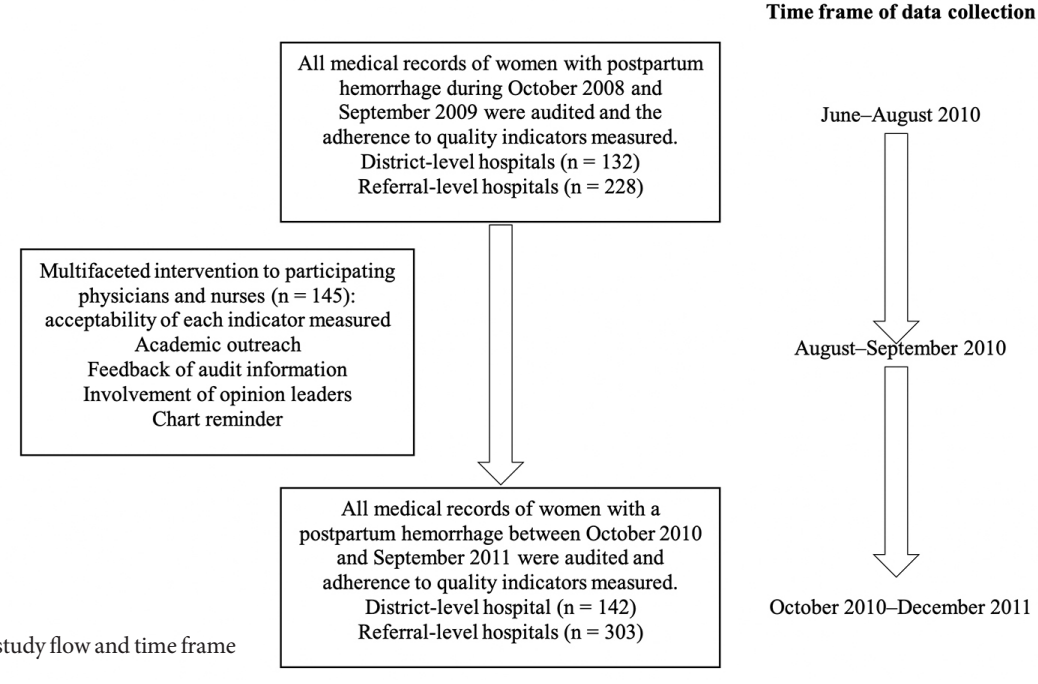

Fig 1. Diagram of the study flow and time frame

RESULTS

Acceptability of the indicators to healthcare providers

Of the 145 healthcare providers from both district and referral hospitals, 124 were women (85.5%) and 38 were physicians (26.2%). Their mean age was 34 years old, with working experience ranging from 1 to 35 years (median 8 years; IQR 3 to 14 years).

In total, 805 medical records of women with PPH were reviewed. During the pre- and post-intervention periods, 132 and 142 were from district hospitals, while 228 and 303 were from referral hospitals, respectively. As shown in Table 1, all the PPH indicators were accepted by at least 80% of the participants, except for surgical intervention. The main reason for the lower acceptability of surgical intervention was because it requires special training and high-level competency.

Use of indicators by healthcare providers

The characteristics of mothers during the pre- and post-intervention periods are shown in Table 2. In district hospitals, maternal age and parity were not significantly different, but significantly higher proportions of preterm birth and normal labor were found during the post-intervention period. However, those 2 characteristics were not significantly different in the referral hospitals.

Table 3 shows the change of adherence to the indicators for PPH. Significant improvements, particularly in the use of indwelling bladder catheter ($p < 0.001$ and $p = 0.007$) and the monitoring of vital signs ($p < 0.001$ and $p = 0.001$), were found after the intervention in both contexts. Of all the women with PPH, uterine atony was diagnosed in 78% of women attending district hospitals and 69% of women attending referral hospitals.

TABLE 1. Acceptability of quality indicators on postpartum hemorrhage rated by healthcare providers.

Indicators for postpartum hemorrhage	Type of hospital District hospitals n (%)	 Referral hospitals n (%)
Diagnosis		
Registration of estimated blood loss	75 (88.2)	58 (96.7)
General management		
Administration of intravenous fluid	85 (100.0)	60 (100.0)
Indwelling bladder catheter	74 (87.0)	54 (90.0)
Monitoring of blood pressure and pulse rate every 15 min within 2 h of diagnosis and recording urine output every hour	69 (81.2)	52 (86.7)
Cross-matching blood	NA	53 (88.3)
Specific management		
Uterine atony		
Performing uterine massage	83 (97.6)	60 (100.0)
Administering oxytocin	77 (90.5)	56 (93.3)
Administering methylergometrine	75 (88.2)	57 (95.0)
Administering prostaglandin E2	NA	52 (86.7)
Surgical intervention	NA	42 (70.0)
Retained placenta		
Manual removal of placenta	NA	53 (88.3)
Uterine massage and administration of uterotonic drugs after removing the placenta	78 (91.7)	58 (96.7)

Abbreviation: NA = not applicable

TABLE 2. Characteristics of women with postpartum hemorrhage before and after the intervention.

Intervention period	District hospitals			Referral hospitals		
	Pre-intervention (n = 132) n (%)	Post-intervention (n = 142) n (%)	*P**	Pre-intervention (n = 228) n (%)	Post-intervention (n = 303) n (%)	*P**
Age (years), mean (SD)	28.61 (6.69)	28.49 (6.72)	0.80	28.8 (6.8)	29.27 (7.15)	0.99
Age group (years)			0.49			0.39
≤20	10 (7.6)	16 (11.3)		13 (5.7)	25 (8.3)	
20-34	92 (69.7)	100 (70.4)		149 (65.4)	183 (60.4)	
≥35	29 (22.0)	26 (18.3)		66 (28.9)	94 (31.0)	
Missing data	1 (0.7)	0		0	1 (0.3)	
Parity			0.66			0.66
Nulliparity	36 (27.3)	36 (25.4)		75 (32.9)	106 (35)	
Multiparity	90 (68.2)	96 (67.6)		145 (63.6)	190 (62.7)	
Grand multiparity	6 (4.5)	10 (7.0)		8 (3.5)	7 (2.3)	
Gestational age group			0.38			0.17
<37 weeks	9 (6.8)	15 (10.6)		46 (20.2)	63 (20.8)	
≥37 weeks	122 (92.5)	127 (89.4)		182 (79.8)	236 (77.9)	
Missing data	1 (0.7)	0		0	4 (1.3)	
Route of delivery			0.02			0.86
Normal labor	92 (69.7)	112 (78.9)		123 (53.9)	151 (49.8)	
Cesarean section	25 (18.9)	26 (18.3)		82 (36.0)	107 (35.3)	
Operative delivery	15 (11.4)	4 (2.8)		23 (10.1)	33 (10.9)	
Missing data	0	0		0	12 (4.0)	

Number in the table are frequency and percent unless stated; SD, standard deviation

*Continuous data analyzed by unpaired t test; categorical data omitting missing data analyzed by Chi-square test.

The implementation of specific management for uterine atony and for a retained placenta in district hospitals was not significantly different between the two periods, while the implementation of uterine massage in uterine atony ($p < 0.001$) and manual removal of a retained placenta ($p < 0.001$) were significantly improved in the referral hospitals.

The clinical outcomes of women with PPH are shown in Table 4. Neither maternal nor neonatal outcomes were significantly changed after the intervention. More than half of those who were diagnosed in the referral hospitals had a blood loss of 1,000 mL or more and received a blood transfusion. Hysterectomy was performed in 10% of cases. Few women diagnosed as PPH showed an estimated blood loss of less than 500 mL; however, the nurse records revealed that vaginal bleeding was continuously observed within 24 h of parturition without quantitative estimation.

DISCUSSION

The management of PPH as monitored by quality indicators was improved after multifaceted intervention was implemented aimed at physicians and nurses. However, the effect on clinical outcomes was not identified in this study. A significant improvement of active care, particularly in the use of indwelling bladder catheters

TABLE 3. Percentage adherence to the quality indicators for the care of postpartum hemorrhage.

Intervention period	District hospitals			Referral hospitals		
	Pre-intervention (n = 132) n (%)	Post-intervention (n = 142) n (%)	*P**	Pre-intervention (n = 228) n (%)	Post-intervention (n = 303) n (%)	*P**
General management						
Indwelling bladder catheter	58 (43.9)	134 (94.4)	< 0.001	173 (75.9)	259 (85.5)	0.007
Monitoring of blood pressure and pulse rate every 15 min within 2 h of diagnosis and recording urine output every hour	88 (66.7)	141 (99.3)	< 0.001	209 (91.7)	297 (98)	0.001
Administration of intravenous fluid	130 (98.5)	142 (100)	0.23	228 (100)	302 (99.7)	1
Cross matching	NA	NA	NA	207 (90.8)	277 (91.4)	0.92
Specific management						
Uterine atony	**n = 104**	**n = 109**		**n = 158**	**n = 208**	
Performing uterine massage	103 (99)	102 (93.6)	0.07	105 (66.5)	174 (83.7)	< 0.001
Administering uterotonic drugs	101 (97.1)	109 (100.0)	0.12	156 (98.7)	206 (99)	1
Surgical intervention						0.81
Vessel ligation	NA	NA		2 (1.3)	2 (1)	
B-Lynch	NA	NA		3 (1.9)	6 (2.9)	
TAH	NA	NA		20 (12.7)	21 (10.1)	
Refer	8 (7.7)	11 (10.1)	0.71	NA	NA	
Retained placenta	**n = 27**	**n = 32**		**n = 54**	**n = 72**	
Performing manual removal of placenta	16 (59.3)	25 (78.1)	0.20	42 (77.8)	71 (98.6)	< 0.001
Performing uterine massage and uterotonic drug given after removal of placenta	16 (59.3)	25 (78.1)	0.20	54 (100.0)	70 (97.2)	0.51
Refer	11 (40.7)	10 (31.2)	0.627	NA	NA	

Numbers in table are frequency and percent. *Analyzed by Chi-square test or Fisher's exact test as appropriate.
Abbreviations: NA = not applicable; TAH = total abdominal hysterectomy

and the monitoring of vital signs, was found after the interventions in both district and referral hospitals. The adherence to the quality indicators was related to their acceptability from the healthcare providers. However, a significant improvement of adherence to the indicators after the intervention could not be identified for all indicators due to the low prevalence of certain specific conditions (e.g., retained placenta at a district hospital) or a high baseline adherence > 90% before the intervention. On the other hand, some specific quality of care indicators (uterine massage and manual removal of a retained placenta) were significantly improved at only referral hospitals because of the low baseline adherence and higher number of cases there than in district hospitals.

A multifaceted intervention with various approaches, including audit and feedback, educational outreach,

TABLE 4. Clinical outcomes of women with postpartum hemorrhage.

Intervention period	District hospitals			Referral hospitals		
	Pre-intervention (n = 132) n (%)	Post-intervention (n = 142) n (%)	*P**	Pre-intervention (n = 228) n (%)	Post-intervention (n = 303) n (%)	*P**
Maternal complications						
Amount of blood loss (mL)			0.50			0.51
<500	7 (5.3)	3 (2.1)		13 (5.8)	11 (3.6)	
500-999	74 (56.1)	86 (60.6)		92 (41.1)	116 (38.4)	
1,000-2,499	49 (37.1)	52 (36.6)		96 (42.9)	137 (45.4)	
≥2,500	2 (1.5)	1 (0.7)		23 (10.3)	38 (12.6)	
Blood transfusion	36 (27)	28 (34)	0.39	131 (57.5)	163 (53.8)	0.45
Shock	21 (15.9)	25 (17.6)	0.83	26 (11.4)	27 (8.9)	0.42
Hysterectomy	1 (1)	1 (0.7)	1	23 (10.1)	32 (10.6)	0.97
Length of hospital stay (days)			0.70			0.91
Median, IQR	3 (2,4)	3 (2,3)		4 (3,6)	4 (3,5)	
Refer	19 (14.4)	22 (15.5)	0.93	NA	NA	
Neonatal complications						
Apgar scores <7 at 5 min after birth	2 (1.6)	2 (1.4)	1	9 (4.1)	17 (6.2)	0.41
NICU admission	NA	NA		15 (6.6)	18 (5.9)	0.91

Numbers in table are frequency and percent except for length of hospital stay (median (IQR, interquartile range)). *Analyzed by Chi-square test or Fisher's exact test as appropriate.

Abbreviation: NA = not applicable

involvement of local opinion leaders, and reminders, was chosen as the intervention in our study because there is evidence that these interventions can change the behavior of healthcare professionals.[17,21–23] A literature search in PubMed performed on October 14, 2019, using the terms "multifaceted intervention" and "postpartum hemorrhage", revealed 6 articles, including a controlled trail[24] and 2 randomized-controlled trials[25–26], as well as 3 before-and-after quasi-experimental trials.[20,27,28] Although these studies showed a variation in the outcomes monitored of PPH, the use of multifaceted intervention was a common strategy for preventing PPH and improving its management.[29]

In the present study, the healthcare providers who worked in the participating hospitals contributed to the design process to aid considering whether the management strategies were feasible and practical in their contexts and would be supported by policymakers before the strategies were implemented. Details of the development and assessment of the quality of care indicators were published previously.[15] Apart from the importance of the content disseminated, educational outreach assists the provision of an audit of the relevant indicators in the clinical setting, and contributes to an opportunity for discussion between the members of the care team. The involvement of opinion leaders and reminders are helpful for encouraging the continuity of good practice. Therefore, multiple approaches as a multifaceted intervention have been proven to be effective in changing the practice of medical professionals.[17,20,21]

The accuracy of estimating blood loss during delivery and immediately postpartum is a challenge. Visual estimation

is common practice but has low sensitivity, leading to the underestimation of PPH in 89% of cases.[30] Although various techniques were used in previous studies, no definite method is recommended in clinical practice.[31]

Guidelines for PPH management were different in each context.[18,20] Our management criteria were developed from evidence-based guidelines and based on the acceptability of healthcare providers as quality indicators.[15] Adherence to practices such as cross-matching of blood and vital sign monitoring both pre- and post-intervention periods in our study were better than those reported in a study in Malawi.[19] Significant improvements in the use of indwelling bladder catheters and the monitoring of vital signs was found after the interventions in this study. These practices are important for the early detection of hemorrhagic shock.[8]

The study has a few limitations to report. First, a study using an interventional design may be subject to possible selection and outcome bias. However, the indicators of PPH management were applied to all diagnosed cases, regardless of the patient age, parity, gestational age, or route of delivery. Second, the results of a quasi-experimental before-and-after study may be affected by temporal changes. However, the outcomes in the present study were registered immediately after intervention, which minimizes the outcome change over time. In addition, the benefit of multifaceted intervention for PPH has already been shown in randomized-controlled trials, thus a quasi-experimental interventional study is a reasonable choice for the study design. Finally, this study could not identify the effect of the improvement of the quality of care on maternal and neonatal clinical outcomes because this was not the main objective of the present study, therefore the sample size was not calculated for improving clinical outcomes. A well-designed clinical trial to determine the effect of implementing the indicators on the quality of care and the incidence of complications is thus warranted.

CONCLUSION

The use of indicators for the quality of care for PPH was acceptable to healthcare practitioners and their adherence to indicators was improved after implementing a multifaceted intervention targeting the practitioners. The guideline for the development and implementation of indicators can be applied to other hospitals with a similar setting to the eligible criteria of the present study.

ACKNOWLEDGMENTS

This study is supported by the Thailand Research Fund and Office of the Higher Education Commission via the Royal Golden Jubilee PhD Program and a Research Chair Grant from the National Science and Technology Development Agency (NSTDA) [Grant number P-10-10307 to TL]. We thank all participants for their support and for providing fruitful opinions and comments on the indicators developed.

Conflicts of Interest Statement: The authors have each completed and submitted an ICMJE Uniform Disclosure Form for Potential Conflicts of Interest. The authors declare there are no conflicts of interest to report.

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