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Postpartum Hemorrhage Management Educational Quality Improvement Initiative

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Abstract

Objective: To develop a multidisciplinary educational program to increase management and preparedness relating to postpartum hemorrhage (PPH).

Design: In-person didactic lecture consisting of ten hemorrhage-related components in combination with a pre-test and post-test.

Setting/Local Program: The project was conducted at a newly built mother-baby unit in a suburban, community hospital. Roughly 1,500 deliveries occur each year in which 12 were classified as PPH. Due to the unfamiliarity with the new obstetric population at this institution, a need was identified to implement education which consisted of improving PPH readiness, response, and recognition.

Participants: The 39 participants, including an assistant partner, surgical technicians, and registered nurses with varying levels of education in the hospital's perioperative and mother-baby unit, completed the educational PPH program.

Intervention/Measurements: The program included a didactic lecture incorporating ten aspects of PPH management led by trained student registered nurse anesthetists. A prerequisite to the didactic portion was a pretest, which was then followed by a post-test.

Results: The post-test indicated a 30% increase in scores compared to the pre-test and $p < .01$. The participants expressed an increase in knowledge and confidence related to caring for PPH management after the completion of the program.

Conclusion: The multidisciplinary program which included didactic lecture and testing of knowledge retention improved the team's confidence and knowledge of PPH management recognition, response, and readiness.

Keywords

postpartum hemorrhage management, postpartum hemorrhage, obstetric hemorrhage, interdisciplinary, obstetric emergency, didactic lecture

Disciplines

Maternal, Child Health and Neonatal Nursing | Nursing

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Call outs:

1. Postpartum hemorrhage has been identified as the leading cause of preventable maternal mortality; provider treatment error is the most common preventable cause.
2. The educational PPH program led to participants having increased levels of knowledge related PPH management evidenced by roughly a 30% increase in post-test scores. increased the team's knowledge by 30% on post-test scores.
3. Continuing education for maternal hemorrhage can ensure care team preparedness when handling low-frequency, high-risk scenarios such as PPH.

Précis

The multidisciplinary educational program improves the team's confidence and knowledge related to PPH management recognition, response, and readiness.

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Problem Description

Moments of joy and happiness are emotions a new mother should experience after the birth of her newborn. Unfortunately, some mothers experience hardship and heartache from unforeseen adverse events during delivery. In June 2017, a new mother-baby unit opened in a suburban, community hospital. An anecdotal report from staff revealed a knowledge deficit related to maternal hemorrhage. Qualitative data reflecting a provider knowledge deficit and low self-efficacy drew concern. Rough 1,500 deliveries occurred within the first year of opening the unit. Of these deliveries, 12 were classified as postpartum hemorrhage (PPH), and four required massive transfusion protocol initiation. The perioperative staff were unfamiliar with caring for this patient population; therefore, critical resource management and PPH knowledge was warranted.

Available Knowledge

PPH accounts for 25% of preventable causes of death worldwide and 12% of maternal deaths in the United States (U.S.) (Evensen, Anderson, & Fontaine, 2017). The World Health Organization (WHO) classifies PPH as the leading cause of maternal mortality in low-income countries (United Health Foundation, 2018). Among developed countries, the U.S. has the highest maternal mortality rate (United Health Foundation, 2018). In 1987, the U.S. pregnancy-related mortality ratio was 7.2 deaths per 100,000 live births (Creanga et al., 2015). Between 2011-2013, PPH accounted for 11.4% of pregnancy-related deaths (Creanga, Syverson, Seed, & Callaghan, 2017). In 2013, it has more than doubled to 17 deaths per 100,000 live births (Creanga et al., 2015). In 2014, the ratio was 22 per 100,000 live births which is four to five times higher than equivalent high-resource countries and double that of Canada (Clark & Belfort,

2017). Recent evidence suggests this ratio is increasing. Moreover, maternal death ratios are underestimated by 20-87% due to the reliance on administrative data (Clark & Belfort, 2017). Considering the U.S. utilizes two times the percentage of gross domestic product (GDP) on health care compared to other countries, the United States' maternal mortality is a national humiliation (Clark & Belfort, 2017).

Rationale

According to the WHO, most deaths resulting from PPH occur during the first 24 hours after birth. There is an overwhelming amount of evidence stating that mortality from obstetric hemorrhage is preventable. It has been identified that 54-90% of maternal deaths caused by PPH were deemed preventable and provider treatment error was the most common preventable factor (Berg et al., 2005; Della Torre et al., 2011). Fuchs, Miller, and Berkowitz (2009) researched causes of maternal morbidity and discovered 13% of PPH cases involved avoidable delays in diagnosis, 11% were due to failure to follow protocol, and 5% involved inadequate training or supervision. Bingham (2012) applied the generic errors modeling system to obstetric hemorrhage and found the three most common errors made were skill-based, rule-based, and knowledge-based errors. Further evaluation emphasized readiness, recognition, and response as crucial components of provider error reduction strategies (Bingham, 2012).

Della Torre et al. (2011) recommends all new interventions should be concentrated on decreasing providers treatment errors; hence, a training program focusing on PPH education through lecture and testing was developed. Kominiarek et al. (2016) analyzed the effectiveness of the training program developed by Della Torre et al. (2011) and found significant improvement in early recognition and initiation of treatment. According to Einerson, Miller, and Grobman (2015), the expansion of multidisciplinary patient safety programs can heighten

obstetric interventions and improve maternal outcomes related to PPH. According to Goffman, Nathan, and Chazotte (2016), obstetric hemorrhage bundles or safety programs have been implemented successfully with improved outcomes demonstrated.

PPH is classified as a low-frequency, high-risk event; therefore, continuing education, planning, and preparation are necessary to decrease the probability of unfavorable outcomes (Association of Women's Health, Obstetric, and Neonatal Nurses [AWHONN], 2017).

Multidisciplinary obstetric teams must be prepared to manage hemorrhage during all stages of delivery. Based on this research, PPH critical resource management implementation and increased provider knowledge will decrease the frequency of poor outcomes related to PPH.

Specific Aims

The primary aim of this project was to raise awareness about the rate of preventable PPH mortality. A secondary aim was to educate providers utilizing the Knowledge to Action Framework based on Graham's Theory of Knowledge (Field, Booth, Ilott, & Gerrish, 2014). Participants were educated through a powerpoint lecture on the significance, management and team dynamics of PPH. This knowledge increase was attainable through the use of validated lecture content, bridging the gap from evidence to practice. The effectiveness was assessed by performing an analysis on pre- and post-test scores. The intervention occurred over a two-month period from June to July 2018.

Methods

Context for Planning the Intervention

Our team consisted of three doctoral-prepared nurse anesthesia students that recognized the need for improving knowledge and awareness of PPH by identifying the occurrence on a national and local level. The goal was to improve readiness, recognition, and response of PPH

through the use of current evidence-based management guidelines from leading organizations. Establishing an educational intervention will help improve the standardization of PPH management. The program champions included a certified registered nurse anesthetist (CRNA) and an operating room nurse manager from the hospital the intervention took place. The educational intervention targeted perioperative staff with the potential of encountering a PPH event.

Intervention

The project was a single-group pre-test, post-test design with an educational session as the intervention. The educational session consisted of a 21 slide powerpoint that adapted the national guidelines from the California Maternal Quality Care Collaborative (CMQCC), Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) and the American College of Obstetricians and Gynecologists (ACOG). The powerpoint content included the definition of PPH, PPH management and significance, team dynamics, PPH quantification of blood loss, transfusion management, etiology of PPH, and lethal triad coagulopathy cascade. Images of the location of the unit's PPH box, central line kit, Belmont rapid infuser, and supplies were also included in the powerpoint.

Measures

The study was performed in a suburban, community hospital setting. The current PPH protocol is a revised replication of the CMQCC. The project components started with identifying the PPH occurrence on a national and local level. After extensive research on the CMQCC, four domains were highlighted to guide PPH management: 1) improving readiness through having critical care supplies available and establishment of a hospital-based PPH protocol; 2) refining recognition of hemorrhage achieved by assessing, recording, and reporting quantified blood loss;

3) improving response time through simulation and debriefing exercises; and 4) improving reporting by standardizing definitions for PPH (Bingham, 2012). These domains and national guidelines from AWHONN and ACOG were incorporated into an educational powerpoint. The pre-test and post-test comprised of 10 multiple choice questions about PPH management and significance, team dynamics, PPH quantification of blood loss, transfusion management, etiology of PPH, and the lethal triad coagulopathy cascade. A doctoral-prepared CRNA who specialized in obstetric anesthesia, validated the tests and powerpoint. The pre-test also asked the participants five demographic questions about their gender, profession, area of specialty work, years of experience, educational level, and years of experience with the obstetric population. The 10 multiple choice questions which were worth one point each. No partial answers were accepted and only one answer was the correct response.

The participants each had one white envelope with a number and letter “A” written on it and another envelope with the same number and letter “B” to ensure deidentification and accuracy. The letter “A” stood for the pre-test and the letter “B” for the post-test. The numbers on the envelope enabled the co-investigators to ensure there were no identifiable factors and allowed for an accurate grading comparison between the pre and post-test. Each participant took the pre-test or letter “A” prior to the educational session followed by the post-test or letter “B”. Five minutes were allotted for the pre-test and the same for the post-test. The PPH educational powerpoint took less than 20 minutes to deliver.

Sample Population

The inclusion criteria consisted of an interprofessional population comprised of surgical technical partners, assistant partners, associate prepared registered nurses (RNs), bachelor prepared RNs, masters prepared RNs, and doctoral prepared RNs that work in the perioperative

and obstetrical department. The exclusion criteria were individuals that did not work in the perioperative or obstetrical departments at this hospital system.

Analysis

A priori, we determined a sample size of 34 per group would achieve 81% power to detect a minimum difference of 0.5 in the mean scores between the groups with an estimated standard deviation of 1.0, at an alpha of 0.05 using a two-sided paired t-test (PASS 16, Kaysville, UT). However, the main outcome was determined to not be normally distributed and therefore, non-parametric statistical approaches were utilized (e.g., Kruskal Wallis, Wilcoxon signed-rank test). All analyses were conducted using IBM SPSS Version 26 (Armonk, NY).

Ethical Considerations

Our project was submitted to the Institutional Review Board (IRB) in February 2018. The project qualified as a quality improvement initiative that did not meet the definition of human participant research; therefore, received IRB exemption.

Results

Four educational sessions were conducted in the summer of 2018. Thirty-nine individuals participated in the educational didactic lecture on PPH management. Two participants were excluded from the sample. One due to loss of follow up and one participant did not complete the pre- or post-test. The overall compliance rate was greater than 94% of the eligible staff members. Registered nurses (n = 31) represented 83.7% of the participants. The participants consisted of eight RNs, 20 bachelor-prepared RNs, two masters-prepared RNs, and one doctoral-prepared CRNA. Approximately 16% represented ancillary staff: one assistant partner and five surgical technicians. Twenty-seven participants worked in the perioperative unit, and 10 participants

worked in the obstetric unit. Eleven participants had 0-4 years of experience, seven had 5-14 years of experience, and 19 participants had 15 years or more of experience.

The mean pre-test score was 6.11 and the mean post-test score was 9.16, which was approximately a 30% increase after the PPH educational intervention. A Wilcoxon signed-rank test was performed for the nonparametric data. The participants improved their test scores and there were no negative ranks. A $p < .01$ indicated the educational powerpoint was not only statistically significant, but effective. A Kruskal-Wallis test was conducted to compare years of experience and years of obstetrical experience within our pre-test scores and post-test scores. The results showed no variation of scores between the different years of experience.

Discussion

Summary

This PPH program was based on didactic, multidisciplinary presentation incorporating a pre-test and post-test. Developed and implemented by doctorate-prepared nurse anesthesia students and designed to improve response time related to PPH management through four critical components described by the *California Maternal Quality Care Collaborative Obstetric Hemorrhage Safety Bundle*: readiness, recognition, and response (California Maternal Quality Care Collaborative, 2018). The program provided education about PPH management, which increased the multidisciplinary team's knowledge and raised awareness about the rate of preventable PPH.

Some particular strengths of the project were improved care team preparedness for critical maternal hemorrhage clinical scenarios. Also increased provider knowledge of clinical history and criteria that may increase maternal risk of PPH.

Interpretation

The educational intervention improved the team's knowledge and confidence in PPH management. Years of experience or higher level of education did not equate to better test scores. After the California Maternal Quality Care Collaborative (2013) employed their safety bundle in 2006, California has seen maternal mortality decline by 55%. In 2006, California's maternal mortality was 16.9 deaths per 100,000 live births to 7.3 deaths (California Maternal Quality Care Collaborative, 2013). In contrast, the United States' national maternal mortality rate has persisted to rise.

Limitations

Knowledge retainment was not determined over a long period due to a three-month deadline for implementation. The perioperative and obstetric staff availability for education lecture were constrained to time limitations. Not all obstetric staff were able to attend the educational session at one time due to nurse-patient ratios. PPH is considered a low-frequency, high-risk event; therefore, loss of competence and knowledge can occur soon after the intervention. PPH being classified as a low-frequency, high-risk can also progress into the providers' having decrease clinical knowledge and confidence in making clinical decision related to PPH management. The co-investigators, Zachary Adams, Benjamin Blanco, and Adele Roda were not hospital employees; consequently, this led to limited buy-in from stakeholder and potentially decreased participation. Education was completed at one site; therefore, it cannot be generalized to another hospital with different resources, protocols, or population.

Conclusion

Even though obstetric hemorrhage education implementation was difficult to plan around scheduling conflicts, the impact of the intervention was accomplished in a brief time frame. An multidisciplinary PPH program at a suburban hospital led to participants having increased levels

of confidence and knowledge related to PPH management as evidenced by increased post-test scores.

Future recommendations for improvement include replicating the study with a robust sample size, longer period of time between intervention and post-test to determine long-term retention, and PPH management simulation scenario with hemorrhage specific crash cart.

Transforming the powerpoint into online modules for annual education renewals and new staff orientation so training or education is accessible and flexible for staff employees is another recommendation for future research. Facilitating a quality improvement initiative without being a hospital employee makes it difficult to gather faculty buy-in, therefore; a prior relationship with stakeholder buy-in is recommended.

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