AN OBSTETRICAL EMERGENCY MANAGEMENT QUALITY IMPROVEMENT PROJECT

by

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Abstract

Obstetrical Emergencies occur in approximately five % of births necessitating immediate interventions to prevent catastrophic consequences. A knowledge deficit specific to obstetrical emergencies was the impetus for this project. The IOWA Model of Evidence Based Practice was utilized to develop a strategic plan that included the implementation of educational sessions and simulation drills to improve clinical knowledge, and team performance. Following didactic and simulation education, the obstetrical team demonstrated improved knowledge test and TEAM tool scores. Knowledge and performance improvement will be sustained with quarterly drills.

Keywords: obstetrical emergency, shoulder dystocia, postpartum hemorrhage, simulation education, quality improvement, teamwork, TEAM tool

Précis: Didactic sessions utilizing simulation and debriefing training improved clinical knowledge, teamwork in a labor and delivery unit.

An Obstetrical Emergency Management Quality Improvement Project

Introduction

The majority of obstetrical (OB) experiences are characterized by an easy labor and birth culminating in the appearance of a healthy son or daughter. In the United States, approximately five % of OB patients will experience a life-threatening OB emergency during childbirth. These emergencies occur during labor and delivery or immediately after birth and require rapid identification and management by the medical team to ensure the best possible clinical outcomes. Shoulder dystocia (SD) and postpartum hemorrhage (PPH) are the most common OB emergencies occurring in clinical practice and require a team approach to treatment (Sorensen, 2007).

The purpose of this project was to improve patient outcomes by educating and training the OB team to identify and manage obstetrical emergencies without costly delay. OB emergencies cannot be predicted but patient outcomes can be improved with knowledge and training. Clinical OB emergency management knowledge was lacking despite mandatory computer based educational classes. A group of key OB stakeholders concluded that additional educational methods should be implemented to improve clinical knowledge and performance. The stakeholder group directed by the director of this project chose to develop an educational intervention combining didactic education with simulation training and debriefing sessions to improve clinical performance and knowledge.

Background and Significance

The organization is a for-profit hospital that is located in a metropolitan city. The women's services unit provides care to 3,500 patients annually and assists with1800 births each year. The women's services unit offers a comprehensive compliment of obstetrical services and

maintains a level three neonatal intensive care unit. Additionally the unit provides OB education classes to the community.

In an effort to identify and remain abreast of any trends or clinical practice opportunities, a comprehensive risk reduction review is conducted annually in January specific to the OB microsystem. Led by the director of this project, the review is conducted by the quality department in collaboration with the administrative team and members of the medical staff. OB incident reports, root cause analysis (RCA) reports, and both internal and external OB quality metrics are reviewed during this assessment. The OB and Neonatal Intensive Care Unit (NICU) data is benchmarked against other hospitals in the division and corporation to identify any trends or areas of concern that warrant further analysis.

Several factors contributed to the significance of this project. First, the mixture of new, inexperienced, and contract nursing staff contributed to the development of a knowledge deficit in the OB team since the OB team members were having difficulty identifying and managing OB emergencies. Secondly, the labor and delivery (L&D) unit experienced significant turnover in leadership and bedside staff during the previous two years. This exacerbates the problem as the majority of the staff has less than eighteen months tenure at the hospital and the utilization of supplemental contract travelers is necessary to fill the remaining open positions.

The Iowa Model of Evidence-Based Practice was used as the framework to guide the specific phenomenon of inquiry for this project. Following the Iowa algorithm, a knowledge deficit specific to obstetrical emergencies was the main impetus for study and exploration, which the team concluded as the main premise for review (Doody & Doody, 2011). The collaborative team recruited additional team members from the point of service and began to review current evidence and practices. The current education model in place for all new and contract staff

utilizes computer based modules to validate clinical knowledge. The collaborative team worked together to develop implementation and evaluation plans to improve the knowledge deficit trigger identified through Iowa evidence-based pathway (Doody & Doody, 2011).

The significance of this project resides in that OB emergencies affect countless unsuspecting patients annually, the most common of which are SD and PPH (Sorensen, 2007). SD deliveries account for roughly five percent of all births, and in a quarter of those births, the infant will experience some form of birth trauma (Agency for Healthcare Research and Quality [AHRQ], 2013). According to the AHRQ (2013), birth trauma occurs in seven out of every one thousand births in the United States. PPH remains the leading cause of maternal mortality and morbidity across the world despite advanced treatment protocols and extensive education (American College of Obstetricians and Gynecologists [ACOG], 2014).

ACOG (2014) and The Joint Commission (2010) concluded that ineffective teamwork and communication were contributing factors the majority of adverse OB outcomes. Inadequate OB emergency management has led to dreadful patient outcomes and often results in significant financial risk for healthcare organizations. A rapid response to OB emergencies is critical since a delay of only a few minutes can lead to profound disabilities or death for mothers or infants. ACOG (2014), found that a small percentage of OB emergencies could be prevented if patients are treated at the first sign of clinical instability. Sorensen (2007) found the best method to improve clinical outcomes is to focus on improving clinical skills and teamwork among the team members.

Review of the Literature

A total of 23 articles were included as references for this DNP scholarly project in relation to obstetrical emergency training using CINAHL, MEDLINE, OVID and PUBMED

databases. The studies reviewed were both quantitative and qualitative in nature and have demonstrated improved outcomes with communication, teamwork, knowledge and patient care outcomes following didactic and simulation education. Although the methodology and design of the studies was different, as well as the study and control groups, the studies generated results that supported the use of didactic sessions and simulation scenarios for OB skill training. Additionally the studies ranged in sample size, testing instruments and setting size, but all followed participants for months after the completion of the training.

Several consistent themes emerged from the literature including the importance of didactic education with simulation training, debriefing opportunities as significant learning tools, and the realization that knowledge, communication and teamwork could be improved and maintained after the completion of the educational sessions. According to the systematic review of twelve quantitative studies conducted by Cant and Cooper (2010), the combination of didactic and simulation training was found to be an effective strategy to educate and implement evidence based practice. The study participants demonstrated better clinical knowledge, improved critical thinking, and confidence as compared to the participants in the control group (Cant & Cooper, 2010).

The literature is clear in that there is a significant increase in knowledge and confidence after emergency simulation training (Crofts et al., 2007; Vadnais et al., 2012; Sorensen et al., 2009; Andrighetti, Knestrick, Marowitz, Martin & Engstrom, 2012; and Osman, Campbell & Nassra, 2009). The evidence reveals that debriefing improves teamwork and communication, and that both short and long term knowledge retention occurs with simulation and didactic training. The studies also found that participants experience an increase in recognition and utilization of best practice management for OB emergencies utilizing a pre and post-test design to evaluate

improved knowledge and knowledge retention. Systematic reviews by Schmidt, Goldhaber-Fiebert, Ho, and McDonald (2013), Norman (2012), and Harder (2010), support the use of a combination of didactic and simulation educational venues as a best practice educational method, and revealed that simulation education can be used in a variety of healthcare situations. Additionally these reviews established that simulation education improves the clinical performance of teams during emergency events which have positive effects on patient outcomes.

Clinical Question

In the OB team of nurses, providers and ancillary staff, how does SD and PPH emergency management training utilizing simulation drills and debriefing compared to computer based training modules alone improved team knowledge, teamwork and communication during the three months following training?

Theoretical Framework

Benner's novice to expert theory, and crew resource management were the theoretical frameworks for the project. Benner's theory was used to demonstrate the development of skills and knowledge as a result of didactic and simulation education as the OB team members moved across the novice to expert continuum. The OB team participated in didactic sessions, simulation drills and debriefing to develop the skills needed to transition from the novice level to advanced beginner to competence to proficiency to expert stage. Crew resource management (CRM) has been shown to be an effective method to improve situational awareness by standardizing communication, improving teamwork and quality (Mahlmeister, 2010).

Methods

Project Design

This project design utilized a pretest-posttest design to assess clinical knowledge and to evaluate teamwork and communication. The project utilized instruments developed in previous works from ACOG (2011) and Royal College of Obstetricians and Gynaecologists [RCOG] (2012), California Maternal Quality Care Collaborative OB collaborative team [CMQCC] (2010) and (Cooper, 2010). The clinical knowledge was assessed via the shoulder dystocia and postpartum hemorrhage (SDPPH) knowledge test. The team performance was evaluated using pre-set objective structured clinical examination (OSCE) criteria clinical management checklists and the TEAM tool.

Participants

The project recruited volunteers from the OB team to be divided into five different teams for simulation drills and debriefing. Participants were excluded from the project results if they did not complete the simulation and postpartum education and simulation training, and if they did not participate in pre and post knowledge testing and pre and post team performance evaluation. The project started with a sample of twenty, ending with a sample of fifteen. Of the five that left the study, three went out on maternity leave, two left the department.

The group participated in simulation education utilizing drill scenarios with debriefing sessions at the conclusion of each drill. Emergency management of SD and PPH knowledge was tested before and three months after the educational sessions using the SDPPH knowledge assessment test. The SD and PPH OSCE checklists and TEAM tool (Cooper, 2010) were utilized to assess clinical management and team performance before training and three months after

training was been completed. The anticipated findings of the project included increase knowledge in SD and PPH management, and increased teamwork and communication.

Ethical Concerns

The project was given IRB approval by the university IRB committee. The OB team members were given informed consent and asked to voluntarily participate in the planned intervention. The OB team members that consented to the project were assured anonymity and all data was blinded to protect their privacy and was maintained in a locked file cabinet in a locked office during the project planning, implementation and evaluation. The simulations were evaluated and scored by the OB educator and a physician that were not members of the OB collaborative team.

Intervention Setting and Planning

The interventions took place in the labor and delivery (L&D) or motherbaby (MB) units of the hospital. The educational sessions were conducted in a classroom setting and were taught by the project director. The simulation and debriefing training occurred in a patient room on either the L&D or MB unit. The simulations took place in familiar surroundings to ensure fair evaluations of clinical performance.

A collaborative team of key stakeholders lead by the director of women's services was formed to create a strategic plan to eliminate the knowledge deficit among OB team members. The OB collaborative team (OBCT) involved in this project includes OB administrative team, risk management, quality, physician department chairs and clinical staff. The OBCT used the IOWA algorithm to determine evidence based practice and to develop an implementation strategy to improve clinical knowledge of SD and PPH management. The OBCT developed an

implementation plan based on their literature review that included both didactic and simulation education to improve clinical knowledge, teamwork and communication.

Didactic Intervention

The didactic portion of the intervention was comprised of two-hour sessions that were educational and interactive. Some of the topics discussed in the didactic sessions included how to identify SD and PPH, risk factors for SD and PPH, team roles during an emergency and techniques from CRM theory to standardize communication and improve teamwork (Haller et al., 2008). The SD and PPH management standards included best practice from ACOG (2011) and RCOG (2012) and CMQCC (2010).

Simulation and Debriefing Intervention

The OBCT developed four simulation scenarios based on simulations from the CMQCC (2010). The scenarios replicated four OB emergencies including two SD and two PPH scenarios. Each scenario was designed to assess the OB team's ability to identify the OB problem, to manage the clinical situation and the ability to work together as a team and communicate effectively. Each team participated in both SD and PPH drills. The team performance was evaluated using the SD and PPH OCSE checklists and the TEAM tool. At the conclusion of each drill the OB team took part in a debriefing session to review team performance and to identify what went well and what opportunities for improvement existed.

Tools

This project utilized several tools to assess knowledge and team performance. The OBCT obtained written permission from CMQCC to use their toolkits and the OSCE checklists in the project. The validity and reliability of the SD and PPH OSCE checklists has been established in the CMQCC (2010) literature. The SD and PPH OSCE checklist were used to validate the OB

team's usage of appropriate clinical management of SD and PPH by evaluating if the appropriate intervention was performed.

The OBCT obtained written permission from Dr. Simon Cooper to use the TEAM tool in the project. The validity and reliability of the TEAM tool has been established in the literature (Cooper, 2010) and (Cooper, Cant, & Porter, 2010). The TEAM tool measured team performance including teamwork and communication during simulation drills. The Team tool website was utilized by the OBCT to provide education on TEAM tool usage (Cooper, 2014).

The OBCT developed the SDPPH knowledge assessment test using SD and PPH management protocols from ACOG (2011), RCOG (2012) and the CMQCC (2010). The SDPPH knowledge test will test knowledge of clinical manifestations, risk and consequences and management protocols of SD and PPH. The SDPPH knowledge test was administered to the L&D staff of four neighboring hospitals to determine validity and reliability of the instruments.

Intervention Timeline

The intervention was completed in a series of phases, the first phase included the informed consent process, participants taking the initial SDPPH knowledge test and participating in SD and PPH drills. The second phase included the didactic sessions and simulation and debriefing portions of the project. The OBCT met during this phase to review baseline data and discuss the project implementation. The third phase began three months after the completion of the didactic sessions and the five OB teams completed a second set of simulation drills and the SDPPH knowledge assessment test. Phase four of the project included the completion of data analysis. During the final phase a presentation of the project findings was made to the leadership team and plans were made to utilize the educational method in the future for other patient safety initiatives.

Evaluation Methods

The OB team performance was evaluated by a two person evaluation team consisting of a nurse and a physician. The evaluation team used the SD and PPH OCSE checklist and TEAM tool to evaluate clinical management of SD and PPH as well as overall team performance focusing on teamwork and communication. The SDPPH knowledge test was utilized to determine baseline knowledge and any increase in knowledge as a result of education and simulation with debriefing training. All instruments were determined to be reliable and valid.

Data Analysis

The final sample included fifteen OB team members that were divided into five teams to be evaluated for team performance. The OB team members were all women, had less than five years L&D experience and worked at the hospital for at least six months. All data was analyzed using SPSS version 22.

A statistical analysis of paired sample t-test was completed to determine if pre-test knowledge scores were significantly different from post-test knowledge scores. There was a significant difference in the pre knowledge test scores (M=78.13, SD=9.782) and post knowledge test scores (M=89.60, SD=8.253); t (14) = -5.048, p = 0.000 and p is significant at $p \leq 0.05$ (Tables 1 and 2). The results suggest that knowledge test scores increased. In particular, our results suggest that the didactic and simulation and debriefing intervention improved clinical knowledge.

Table 1

Comparison of Pre and Post Knowledge Tests Scores

Measure	M	N	SD	SEM
Pre Knowledge Test	7.813	15	9.782	2.526
Post Knowledge Test	89.60	15	8.253	2.131

Table 2

Pre and Post Knowledge test score Differences

	Paired Differences							
				95% CI				
	M	SD	SEM	LL	UL	t	df	Sig. (2-tailed)
Pre Test - Post Test	11.47	8.798	2.272	16.339	6.594	-5.048	14	.000

Note.CI = confidence interval; LL = lower limit, UL = upper limit

A statistical analysis of paired sample t-test completed was to determine if pre TEAM tools scores were significantly different from post TEAM tool scores. There was a significant difference in the pre TEAM tool scores (M=6.20, SD=1.304) and post TEAM tool scores (M=8.80, SD=.447); t (4) = -5.099, p = 0.007and p is significant at $p \leq 0.05$ (Tables 3 and 4). The results suggest that TEAM tool scores increased. In particular, our results suggest that the didactic and simulation and debriefing intervention improved teamwork, communication and overall team performance.

Table 3

Comparison of pre and post TEAM tool scores

Measure	M	N	SD	SEM
Pre Knowledge Test	6.20	5	1.304	.5831
Post Knowledge Test	8.80	5	.447	.2000

Table 4

Difference in Pre and Post TEAM Tool Scores

	Paired Differences							
				95% CI				Sig.
Measure	M	SD	SEM	LL	UL	t	df	(2-tailed)
Pre-TEAM Post-TEAM	-2.600	1.1402	.5099	4.0157	1.1842	-5.009	4	.007

Note.CI = confidence interval; LL = lower limit, UL = upper limit

A statistical analysis of paired sample t-test was completed to determine if pre SD OSCE scores were significantly different from post SD OSCE scores. There was a significant difference in the pre SD OSCE scores (M=65.72, SD=9.628) and post SD OSCE scores (M=89.20, SD=1.304); t (4) = -5.163, p = 0.007 and p is significant at $p \leq 0.05$ (Tables 5 and 6). The results suggest that the SD OSCE scores increased. In particular, our results suggest that the didactic and simulation and debriefing intervention improved knowledge of best practice SD management.

Table 5

Comparison of Pre and Post SD OSCE Scores

Measure	M	N	SD	SEM
Pre SD OSCE scores	65.72	5	9.628	4.3057404
Post SD OSCE scores	89.20	5	1.304	.5830952

Table 6

Difference in Pre and Post SD OSCE Scores

	Paired Differences							
				95% CI				Sig. (2-
	M	SD	SEM	LL	UL	t	df	tailed)
Pre SD OSCE Post SD OSCE	23.48	10.169	4.5477	36.106	10.854	-5.163	4	.007

Note.CI = confidence interval; LL = lower limit, UL = upper limit

A statistical analysis of paired sample t-test was completed to determine if pre PPH OSCE scores were significantly different from post PPH OSCE scores. There was a significant difference in the pre PPH OSCE scores (M=68.80, SD=9.550) and post PPH OSCE scores (M=91.40, SD=4.219); t (4) = 7.816, p = 0.001 and p is significant at $p \leq 0.05$ (Tables 7 and 8). The results suggest that the PPH OSCE scores increased. In particular, our results suggest that the didactic

and simulation and debriefing intervention improved knowledge of best practice PPH management.

Table 7

Comparison of Pre and Post PPH OSCE Scores

Measure	M	N	SD	SEM
Pre PPH OSCE	68.80	5	9.550	4.271
Post PPH OSCE	91.40	5	4.219	1.887

Table 8

Difference in Pre and Post SD OSCE Scores

	Paired Differences							
				95% CI				Sig. (2-
	Mean	SD	SEM	LL	UL	t	df	tailed)
Pre PPH OSCE Post PPHOSCE	22.60	6.465	2.891	-30.628	14.572	7.816	4	.001

Note.CI = confidence interval; LL = lower limit, UL = upper limit

Results

The OBCT was able to implement the intervention without any difficulty. The project was not delayed at any point in the project and all planned interventions were implemented. The data collection process was seamless and the nurse physician team was able to agree on team performance during each simulation. Although five team members dropped out of the project, the project was completed on time.

During the didactic and simulation and debriefing training the OB team members rotated through all possible roles so they could assume the roles in a nonthreatening and supportive environment. The benefits of this training were observed in the improved team performance as OB team members did not hesitate to step into the team leader role and they were able to coordinate clinical care and delegate as needed. An additional benefit observed was that

communication was clear and concise and the team members spoke up quickly if they were unsure of their assigned task. The CRM theory training was initiated by the staff during the immediate debriefing at the end of the drill without any prompting by the drill evaluator team.

The OBCT plans to track and trend SD and PPH cases and review the cases bi-monthly during the OB department meeting. The plan will be to compare the data from 2015 post intervention to the 2014 pre intervention data. The OBCT anticipates seeing an improvement in the 2015 OB quality metrics compared to the 2014 metrics when the next annual OB review occurs in January 2016.

Discussion

Summary

The OB collaborative team utilized the IOWA Model of evidence based practice algorithm to eliminate a knowledge deficit in the OB team. A two-pronged approach was chosen to address this issue utilizing an intervention of didactic and simulation education with debriefing training. The project was found to improve knowledge of clinical management of SD and PPH and improved team performance with improved teamwork and communication. The OB team stated that they are more comfortable managing emergency situations and that they feel that teamwork and communication on the unit has improved.

Relation to Evidence

This project as in studies by Crofts et al. (2007) and Vadnais et al. (2012), found an increase in clinical knowledge after education and simulation training. The project found similar results in improved team knowledge and performance as observed in the Sorensen et al. (2009) study. The project findings support the finding of improved clinical knowledge, teamwork and communication in studies by Schmidt, Goldhaber-Fiebert, Ho, and McDonald (2013), Norman

(2012), and Harder (2010). The interventions utilized in the project demonstrated similar results to the studies by Schmidt, Goldhaber-Fiebert, Ho, and McDonald (2013), Norman (2012), and Harder (2010) and reinforce the utilization of didactic and simulation training as a best practice educational method.

Limitations

The most significant limitation of the project was the small sample size. The project started with twenty OB team members but ended with a total of fifteen members due to attrition. The anticipated project results came to fruition and the study could be implemented in any other L&D unit. Outcomes data will be reviewed annually to evaluate if the project improved clinical outcomes.

A variety of changes have occurred as a result of this project beside the improved clinical knowledge and team performance with SD and PPH. The women's services depart has implemented unit-based councils (UBC). The L&D UBC has reviewed and updated all policies and procedures to meet best practice management guidelines and implemented additional resources for PPH management in each delivery room. Additional principles from CRM have been implemented such as unit huddles, quarterly drills, debriefing and stop the line for patient safety.

The OBCT along with the L&D unit-based council has developed a plan to ensure that clinical knowledge and performance remain at their current level. An OB quality team was created with members of the OBCT and the L&D unit-based council and they have used this project to improve collaboration and ownership of clinical practice within the women's services department. The OB team is currently reviewing the literature to determine if the unit should

implement an OB specific rapid response team and begin drills assess for incision to decision time frames for emergency caesarean sections.

The project was presented to the nurse executive council (NEC) of the organization. Based on project results the NEC plans like to use CRM training and simulation training to improve team response during cardiac arrest situations and plans to utilize the TEAM tool for data collection. The NEC plans to utilize components of the project across the organization for a variety of quality and safety projects. These projects can be implemented quickly and with minimal organizational costs since the only cost will be for the educational sessions as drills are conducted during a normal work hours.

Conclusions

The project finding support the findings in the literature that clinical knowledge of emergency management and teamwork and communication during an emergency can be improved with an education program that combines didactic and simulation training. This project can be replicated as a quality improvement project across a healthcare organization for a variety of clinical concerns including code blue initiation, emergency cesarean sections, and crisis management. Future implication of this project include the ability to use the combination education method utilized in this project for emergency management, skill labs, annual competencies, charge nurse education and new graduate education residency programs. The leadership team plans to incorporate this educational model with current computer based modules to ensure the overall education being provided to the clinical staff.

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Callouts

The number of new and inexperience obstetrical team members working in labor and delivery contributed to the identified obstetrical emergency management knowledge deficit.

Proposed intervention of didactic and simulation with debriefing education improved clinical knowledge, teamwork and communication among the clinical team.

The educational model can be replicated in a variety of clinical settings to improve other knowledge deficits or clinical problems.

APPENDIX A. STATEMENT OF ORIGINAL WORK

Academic Honesty Policy

Capella University's Academic Honesty Policy (3.01.01) holds learners accountable for the integrity of work they submit, which includes but is not limited to discussion postings, assignments, comprehensive exams, and the dissertation or capstone project.

Established in the Policy are the expectations for original work, rationale for the policy, definition of terms that pertain to academic honesty and original work, and disciplinary consequences of academic dishonesty. Also stated in the Policy is the expectation that learners will follow APA rules for citing another person's ideas or works.

The following standards for original work and definition of *plagiarism* are discussed in the Policy:

> Learners are expected to be the sole authors of their work and to acknowledge the authorship of others' work through proper citation and reference. Use of another person's ideas, including another learner's, without proper reference or citation constitutes plagiarism and academic dishonesty and is prohibited conduct. (p. 1)
>
> Plagiarism is one example of academic dishonesty. Plagiarism is presenting someone else's ideas or work as your own. Plagiarism also includes copying verbatim or rephrasing ideas without properly acknowledging the source by author, date, and publication medium. (p. 2)

Capella University's Research Misconduct Policy (3.03.06) holds learners accountable for research integrity. What constitutes research misconduct is discussed in the Policy:

> Research misconduct includes but is not limited to falsification, fabrication, plagiarism, misappropriation, or other practices that seriously deviate from those that are commonly accepted within the academic community for proposing, conducting, or reviewing research, or in reporting research results. (p. 1)

Learners failing to abide by these policies are subject to consequences, including but not limited to dismissal or revocation of the degree.

Statement of Original Work and Signature

I have read, understood, and abided by Capella University's Academic Honesty Policy (3.01.01) and Research Misconduct Policy (3.03.06), including the Policy Statements, Rationale, and Definitions.

I attest that this dissertation or capstone project is my own work. Where I have used the ideas or words of others, I have paraphrased, summarized, or used direct quotes following the guidelines set forth in the APA *Publication Manual*.

Signature of author redacted prior to posting per repository policy.